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PETER MERSKY

About the cover:

The Kfir Joins the Navy. Such a nice plane!

Story and cover painting by Peter Mersky

THE U.S. military has rarely operated aircraft produced by other countries, especially after World War II. During the war, the Army Air Force (USAAF) flew a collection of British Spitfires, Beaufighters and Mosquitoes during operations in North Africa and early flights over Europe until the U.S. production effort could get American aircraft to the front. After the war, when much of Europe was in ruins, including most aircraft factories, the United States was in the forefront of aircraft design and production. America purchased only two important foreign products, the British English Electric Canberra, a twin-jet bomber which Baltimore-based Martin produced as the B-57 and the Hawker Siddley Harrier.

There's about to be a minor footnote added. By April 1985, residents around the Oceana Naval Air Station in Virginia Beach will be seeing a small delta-wing single-seat fighter knifing through the skies. No, it won't be an F-106, although the two bear a superficial resemblance. It will be a Kfir — that's Hebrew for Lion. That's right, an Israeli jet has made a small inroad into the bastion of the U.S. Navy. Recently, a lease was signed between the United States and Israel Aircraft Industries (IAI) to supply and maintain 12 Kfir C.1s. The Kfirs will be operated by VF-43 which supplies adversary services to Navy and Marine squadrons. VF-43 flies several different types of aircraft, including A-4s, T-2s, F-5s and T-38s.

With the advent of the post-MiG-21 generation of Russian tactical jets, it became necessary to seek an aircraft which would be able to adequately imitate the performance capabilities of the MiG-23/27 and MiG-29. Accordingly, the Navy began making inquiries as to the availability of more advanced platforms. Until such time as arrangements for a more advanced aggressor fighter can be made, the Navy decided to take advantage of IAI's offer to lease, at no cost, 12 early model Kfirs, complete with a maintenance team which will also train 60 to 70 U.S. personnel. At best, the Kfirs fulfill short-term requirements and are expected to serve approximately three years.

Historically, the Kfir was developed from the French Mirage 5J. When the French embargoed shipments to Israel as a result of the 1967 Arab-Israeli War, the industrious Israelis mated the Mirage airframe with a General Electric J79, the same engine which powered the F-4 Phantom. Entering service in 1975, the Kfir replaced the successful Mirage III as the premier Israeli dogfighter. Until the deployment of U.S.-supplied F-15s and F-16s, the Kfir was the best fighter the Israelis had.

The current version of the Kfir flown by Israel is the C.2 which is immediately distinguishable by its canard surfaces behind the fuselage air intakes. These additional surfaces generate lift at given angles of attack, increasing the Kfir's overall performance and maneuverability. The 12 aircraft leased by the Navy, however, are earlier C.1 models which incorporate strakes rather than full-fledged canards.

Fighting 43 is eagerly anticipating the arrival of the Kfir in March 1985. The aircraft will operate in the current low-visibility paint scheme and will provide much-needed services to the Navy's tactical community.

Peter Mersky is a staff writer for Approach.

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inside approach

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A Kfir C.1 of VF-43 engages two F-14s during ACM training. (See inside front cover story)

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Mishap Investigation Causal Factors

By Lcdr. W.D. Bankart

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CHANCES are, that if you spend a full career as a naval pilot or flight officer, you will have the unpleasant task of being a member of at least one aircraft mishap board. Presented here are some basic concepts of mishap cause factor determination. The intent is to provide food for thought which hopefully, will make you better prepared when that day comes.

To an aircraft mishap investigator, the challenges of uncovering the true causes of a crash are endless. There are many tasks to complete before the answer is revealed. To the untrained or inexperienced person, the sight of a major aircraft mishap is overwhelming. How it is that a sleek and sophisticated machine, piloted by a highly trained and professional crew, could now be represented by a vast wasteland of charred and twisted metal scattered over an area the size of many football fields?

Even more staggering is the thought that a chain of causal factors is masked and hidden within the remains of the wreckage and that they can be analyzed and acted upon to prevent the recurrence of such a tragedy. The job of the

MISHAP CAUSAL TREND

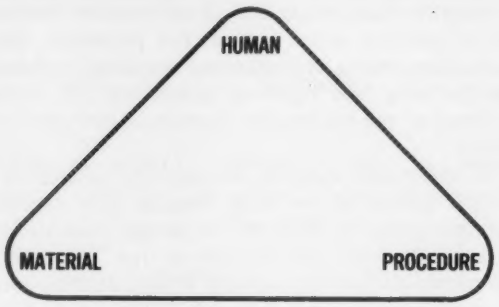


Figure 1

MISHAP CHAIN OF EVENTS

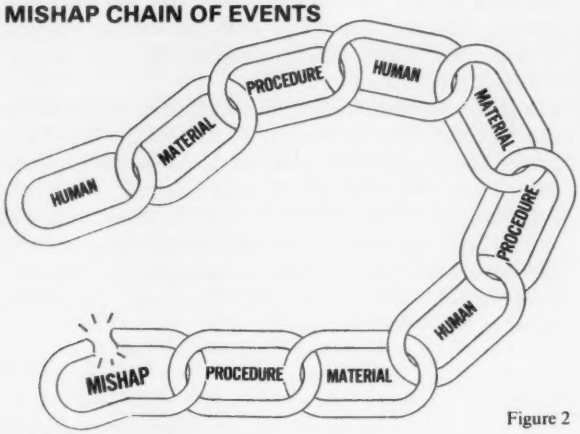


Figure 2

investigator, then, is similar to that of a detective, who searches for clues and seemingly unrelated factors, reassembles the evidence into a logical order and ultimately discovers a chain of events which ended in disaster.

The triad. Rarely does one find a single factor or failure which can be labeled as "THE" cause factor. Instead, the investigator finds himself operating within what can be called the *mishap causal triad* (figure 1) whose elements: (1) material, (2) procedure and (3) human are intricately interrelated and assembled into a definable and unique chain of events (figure 2) with the mishap as the final link.

Material. The *material* component of the triad can refer to a simple material or a complex combination of materials formed or structured for a particular purpose. Material structures and components are created, in part, through externally applied energy which is molded, shaped and assembled into the product. When materials fail, they release some portion of this energy during the failure process. This potential energy is important to the investigator.

Just as important, however, is the method by which the energy was imparted into the component; in other words, the manufacturing and assembly process used to make or repair the product. A failure in one specific component or material can impart improper energy into another and create an undesired avenue of escape for potential energy. For example, fasteners (rivets, bolts, screws) used in the manufacture of an aircraft are made of different materials and possess differing design functions. Using the wrong bolt may, in fact, satisfy the fastening function by holding two components together but that bolt may not be capable of withstanding specific loads experienced during the dynamics of flight. Using the wrong bolt may, instead, create an undesired avenue or pathway through which potential energy can escape.

Another example might be the substitution of glass beads for fine grit in a sandblasting/cleaning process. Although both materials will clean the desired component, glass beads will also "shot peen" the surface of the component, thus altering its microstructure and material characteristics. If the cleaning process is a precursor to the dye penetrant inspection phase of component overhaul, shot peening can, in fact, "close" minute cracks by putting the metal surface under compression. The end result is that a defective component, which should be rejected during inspection, is returned to the production line.

Procedure. In an overview of the *procedure* corner of the triad, one will find all the rules, regulations, specifications and written instructions associated with the manufacture, repair and operation of an aircraft. Procedures are the interface between the human and the machine; the do's and don'ts, the cautions and warnings and the step-by-step methodology.

To the investigator, two aspects associated with procedure, *completeness* and *adherence*, are of concern. First, whether it's the immediate action items for an aircraft with an emergency or the step-by-step procedure for manufacturing a "widget," the procedure must be technically perfect and complete. Any breakdown in the formulation of a specific procedure could lead to premature component failure or loss of complete systems; for example: (a) failure to include a rinse step in the cleaning and inspection phase of component overhaul or, (b) failure to alert the pilot of an aircraft operating in a single-engine emergency that he must carefully evaluate usuable fuel load and distribution. In many cases, through lack of proper procedure, a simple failure will rapidly grow into a complex/compound failure or emergency which may surpass the operator's ability to control or resolve.

The second aspect of procedure which must concern the investigator is whether or not the operator, whether he be pilot or inspector or lathe operator, followed a procedure as intended. Too often one will find that "operational necessity" or "perceived urgency" will result in shortcuts, substitutions or careless neglect which bypass the built-in safeguards of a

carefully formulated procedure.

For example, although a procedure for check and rig of an aircraft flight control system strictly forbids the reuse of cotterpins, a mechanic under the perceived pressure that the aircraft must be used "on the next go" reuses the old cotterpin instead of taking the extra few minutes required to get a new one. Another example might be the lathe operator who neglects to check the runout of his equipment prior to refacing a fuel nozzle seat. In both examples, the operator has neglected or bypassed a preconceived safeguard and set into motion a failure sequence which may not become critical for many additional hours of operation. The operator has now provided a pathway for the unscheduled release of potential energy and started a failure sequence.

The human. The third and final corner of the triad is occupied by the most complex, intricate and variable component, the *human*. A report published by the Army comments that human errors account for a minimum of 50 percent of aviation mishaps in a "good" month and have been as high as 85 percent at other times. Statistical averages for the United States Navy over a five-year period show that 48 percent of all aviation mishaps involve pilot error. Human error is also a common factors thread intertwined through both the *material* and *procedure*.

Unfortunately, as important as the human element is, it is also the weakest link. Man is by far the most unpredictable and least understood variable in any mishap cause and effect study. For materials, their composition, physical properties and failure modes are well known. High technology equipment including the scan electron microscope (SEM) enable investigative failure mode analysis and pinpoint determination of material causal factors. For procedure, precise formulation, testing, evaluation and re-evaluation of design, manufacturing and operating procedures can virtually eliminate all but the smallest fraction of potential causal factors.

For the human, however, we have few tools which can analyze failures of the mind. Human error cannot be inspected under the SEM nor can human error always be prevented through promulgation of specific procedures. The human is a thinking, learning, sensing, decision-making entity subject to emotions, fatigue and mental stress. Given a known and defined situation, decisions made by the human will vary among various individuals and will vary in a specific individual dependent upon his level of training, physical condition, physiological and psychological makeup at that particular moment.

The chain of events. A study in biochemistry will reveal the genetic code found in deoxyribonucleic acid (DNA) is a combination of different nucleic acids assembled in specific sequence to form a message that says blue eyes, brown hair, heart muscle, etc. If we think of the mishap cause factors as similar building blocks, we can then see that there are a vast number of combinations which can be assembled. How then does one control the chain building process to ensure that the final link is NOT a mishap?

MISHAP CAUSAL TRIAD — with CONTROL

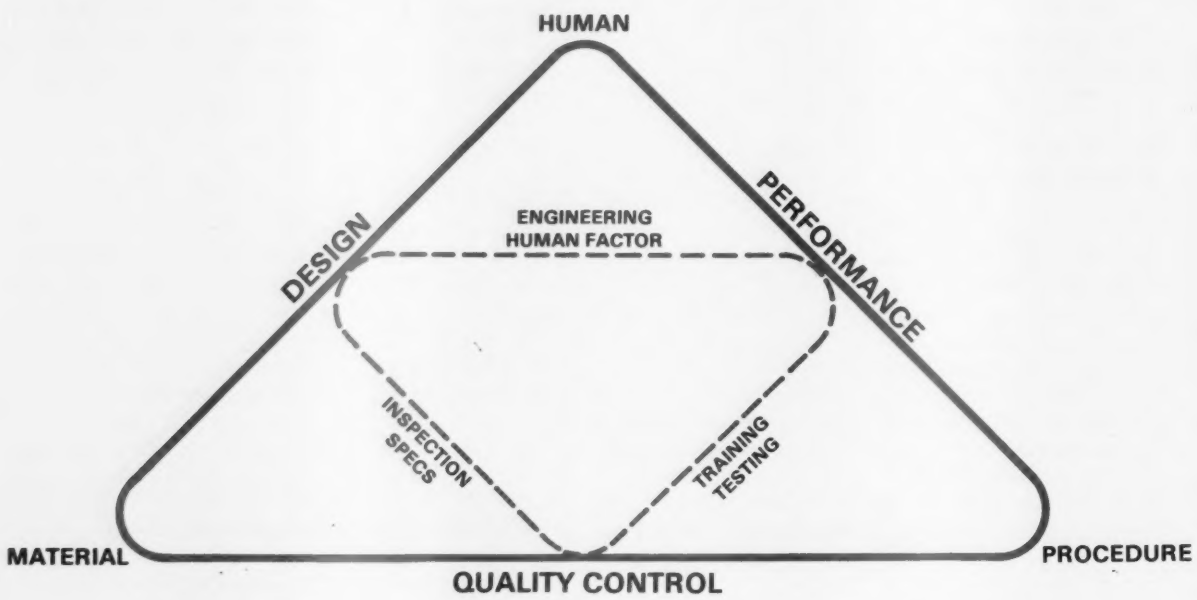


Figure 3

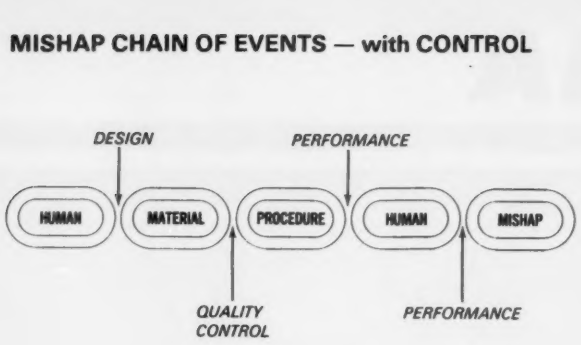


Figure 4

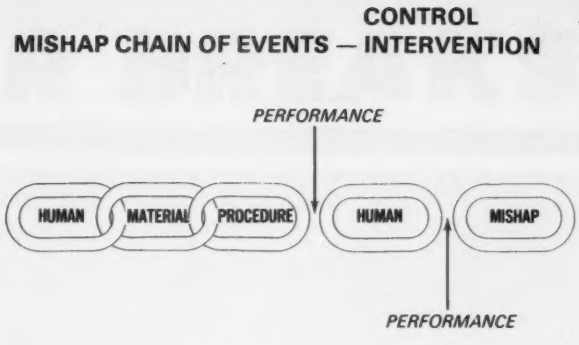


Figure 5

The addition of control factors: (1) design, (2) quality control and (3) performance to our mishap causal triad (figure 3) is the key. *Design* controls include selection of materials, failure probability analysis, human factors engineering and system redundancy, to name just a few factors which integrate the human-material side of the triad. *Quality control* interconnects material-procedure through concepts including design limit, margin of safety, manufacturing and repair processes and equipment, selective and specific testing, independent inspections and trend analysis. The third leg of the triad, human-procedure, is controlled by the performance factor which is defined through human performance studies, performance testing, written instructions (NATOPS/MIMS), standard operating procedures (SOP), training and evaluation programs.

These control factors serve as an insulator or barrier inserted between the major elements of the triad. Since no single element is likely to result in a mishap, the controls serve to keep each element isolated (figure 4). One can think of these factors as essential agents which must be in place to prevent the causal elements from joining together to form a mishap chain of events.

Finally, when one or more control factors are absent and the chain segments start to join, each remaining factor becomes an all important element in breaking the chain and averting the mishap (figure 5).

Multilinear events sequencing. The investigator is called into action because a failure in the control process has led to a mishap. He is faced with determining the cause factors which resulted in the completion of the mishap chain of events. One method of determining these factors is use of a concept called Multilinear Events Sequencing (MES). MES equates the chain of events to a time line which starts when a stable situation is first disturbed and ends with the mishap event or outcome. Although figure (2) depicts a single chain of events, several chains can be building simultaneously and in parallel fashion, finally joining together to reach an outcome. In recording the events, the investigator searches for each individual causal factor or event by starting at the outcome (mishap) and working backward until he reaches the first event which created a disturbance in a stable situation.

The investigator then assigns an action verb (past tense) to describe the action and identifies the assumed time the occurrence began or ended. Following this procedure, the investigator is able to step backward sequentially in time to the beginning of the mishap sequence. As one follows this procedure, he will find that the identified events will fall into one of the three mishap triad categories, either human, material or procedure. Furthermore, the action verbs will identify a failure in one of the control functions, either design, quality control or performance.

Management oversight and risk tree. Another investigative technique is the Management Oversight and Risk Tree or MORT (the pun is unfortunate and unintentional). It is one of the first approaches to a systems analysis concept in mishap investigation. MORT deals with unanticipated or unplanned energy release, searches for failures in the control process and charts the findings in the form of a fault or risk tree. MORT explores three major categories or branches: S — specific oversight, R — assumed risks and G — general characteristics of the management system. Each branch is subdivided into specific factors which contain many distinct areas of interest. Ultimately, MORT addresses the adequacy of certain considerations and reveals those which were improper or less than adequate. The MORT system employs graphic symbols to lead the investigator through a logical and organized network of considerations analysis. Due to its complexity, MORT is best used as a working tool to be developed while the investigation progresses. It is also useful in revealing new areas which require more thorough analysis.

Armed with the understanding of mishap causal factors and a working knowledge of investigative techniques, you, as a mishap investigator, will be better prepared to respond to a mishap occurrence and able to identify hazards which can be analyzed and acted upon quickly. And hazard elimination will be your ultimate goal as an investigator.

Lcdr. Bankart has investigated 18 mishaps as a member of the Naval Safety Center's Aircraft Accident Investigation Division. He is a fighter RIO with over 2,000 hours in F-4s and F-14s. He also has a master's degree in systems management from the University of Southern California.

In A Daze At Night. Following a night Cat 1 FRP bombing sortie, the A-7 pilot returned home with hung ordnance. It had been a long day; a full schedule of briefing and flying. And now a night hop to top it off. We'll let him take the story from there.

"I knew I had to set up for a straight-in approach and proceeded to the initial. It was a moonless night and quite dark, except for ground lights. I remember my mind wandering to things other than flying, so my attention to the task at hand was limited. It was like a long drive on the freeway. Sometimes you can't remember watching the road; you're driving subconsciously. This was the same feeling I had as I lined up for the landing approach. I commenced a shallow descent out of 6,000 MSL and drifted off once more to occurrences during the day.

"My semiconscious flying was putting the field at my near-sea level home field elevation of 200 feet instead of this field's elevation of 4,000! I followed the altimeter casually through 4,700, 4,600, 4,500 ... 4,100! The first fully alert thought I had in the approach was the perception of something moving by the side of the canopy. I looked to the right, and at the same instant, realized it had been too long since I fully concentrated on flying the airplane.

"What I saw going by as I pulled back on the stick was sagebrush illuminated by my anti-collision lights. After climbing up to altitude and lowering the gear and flaps, I made an uneventful landing ... with my eyes wide open and my mind fully engaged.

"There are probably numerous lessons learned here, but the most important is recognizing when you're tired and either canceling yourself before manning up, or if already airborne, making the extra effort to maintain 100 percent concentration until safely shutdown."

Submitted by Lcdr. Scott Thompson

Sea King SAR. Standing the SAR alert, the SH-3 crew scrambled to the alarm for a civilian twin which crashed in a wooded area 15 miles from the southeastern NAS. With a tropical storm approaching, immediate response was imperative. The weather was 300 scattered, 700 broken, 1½ miles visibility, with winds gusting to 28 knots. It was forecast to remain that way. The low ceiling and bad visibility hampered the flight out to the search area, and location of the crash site took 45 minutes of searching a swampy area with tall pine trees and dense undergrowth.

When the site was finally located, a flight crewman was lowered to search for survivors, while the helo flew on to locate a civilian/military search team which was on foot, about three-quarters of a mile away. The crewman on the ground found two of the three people aboard the civilian twin; one was dead and the second suffering from shock, but in

AIR BREAKS

fair condition. As he tended to the survivor, the civilian/military ground team arrived, and eventually the survivor was hoisted aboard the hovering helo. The third person was located alive, but in critical condition. The Sea King flew to the area where the third person was found and hoisted him aboard. The helicopter then flew to the local hospital to deposit its injured passengers.

People get paid for doing their jobs, but SAR personnel deserve a special thanks. Their job can be long hours of waiting, but when the call comes, they go, no matter what the weather or difficulties. Lcdr. E.D. Manning, Ltjg. Gerry Duffy, AD1 Henry Kishman, AW2 Mike Coulter, Lt. Ken Shor (flight surgeon) and HM3 David McIntyre are to be commended for their skill and professionalism during this SAR mission of 28 Sep 1984. — Ed.

Tomcat on a Roll. Two F-14s had been spotted tail over the deck while the carrier pressed on through moderate to heavy seas during an UNREP evolution. Later, the necessity of launching alert aircraft dictated the moving of aircraft. Thus, the plane captain of one Tomcat manned the cockpit while the aircraft was broken down at night. He didn't check the brake accumulator and, perhaps feeling pushed, pumped the cockpit hand pump only three or four times, instead of the 30 pumps needed to fully charge the system.

The director gave the push back signal just as the ship rolled to starboard. The F-14 began to move, and the director, quickly noting the fighter's momentum, gave the urgent signal to halt. Chocks were inserted and the plane captain immediately applied the parking brake.

As the ship stabilized, the director gave the break down signal, whereupon the chockwalkers took the chocks away. The plane captain in the cockpit didn't see the signal, however, and the parking brake remained set. The ship then began a roll to port causing the aircraft to roll forward, pushing its tow tractor ahead of it, eventually forcing the tractor to jackknife. The director gave the emergency signal to halt once again. The chockwalkers responded, and the plane captain tried to apply toe brakes. The ship rolled starboard and then port. All this motion put stress on the tractor towbar, which eventually broke under the strain.

The Tomcat was now free of the tractor and began to roll backward. The chockwalkers tried to place chocks under the wheels to no avail. By this time, the plane captain was endeavoring to get out of the cockpit after first trying the brakes and then dropping the tailhook. He jumped from the seat and sustained fractures to his right foot.

The left chockwalker continued trying to place chocks on his side of the wayward Tomcat but finally cleared out. His companion on the right was more successful, and finally the aircraft was halted, though not before its radome had impacted the Sidewinder and launching rail of an adjacent F-14 and left afterburner and wing tip of a second Tomcat on the right.

The total cost of this mishap was $275,000. What have we learned? First, in heavy seas, the required movement of aircraft is hazardous at best. Plane captains and handling personnel must work together and be especially attentive to signals, avoiding the temptation to rush in such an environment. Second, procedures (ensuring brakes are properly engaged) must be meticulously followed. — Ed.

Corsair Oil Cap Preflight. Fifteen minutes after launching from the CVN, the A-7 pilot was startled to see a master caution light illuminate along with the engine oil light. The oil quantity gauge indicated one-half full — or empty. What happened? (The pilot had preflighted the aircraft in accordance with NATOPS in preparation for the night Case III launch. The oil cap was visually inspected for proper seating in the filler neck, lock mechanism was checked down and oil access door was then closed and latched with no binding or resistance.) Declaring an emergency, the pilot made an uneventful approach and landing aboard the ship.

Post-flight inspection revealed the engine oil cap was seated on the oil filler neck but not properly secured. The result: 202 ounces of oil had syphoned overboard.

The squadron CO commented:

"Luck was the only thing between this incident and a major mishap . . . Had the oil filler cap come completely dislodged during the catapult stroke, aircraft loss would have been the result . . . It is still believed by many in the light attack community that to close the oil access door requires the oil cap to be locked in place. This creates a false sense of security and ultimately, the possible loss of an aircraft. All A-7 drivers should be keenly aware of this problem."

This near miss hazard report has generated a recommended NATOPS change to include the following in the A-7 pilot preflight: "Ensure oil cap is secure by pulling on chain connected to cap." A warning has also been proposed to be included in NATOPS: "Proper security of the oil cap is not assured with the oil access door closed." The recommended NATOPS change should be in print at this time. — Ed. ◄

SAR Drill

By Capt. Rick Curlin, USMC
VT-10

9:17 a.m. . . . "Mayday, Mayday, Mayday. OF40, (a VT-10 T-2 aircraft), we're going into the drink, Navy Pensacola Tacan 275006."

Upon hearing this mayday call, Foxfire 106 (an HC-16 helicopter) immediately initiated a Search and Rescue (SAR) effort. While proceeding to the last given position, Foxfire 106 contacted VT-10 base.

9:19 a.m. . . . "Triple Zero Base, this is Foxfire 106. I have two of your aircrew sighted in the water at the Navy Pensacola Tacan position 275 radial at 6 DME. The two survivors appear to be okay. I am attempting to establish radio contact with them. There are no boats in the area. I am not SAR capable but can remain on station for two hours."

9:21 a.m. . . . "Roger Foxfire 106, we will alert the SAR."

9:21 a.m. "Hello, HC-16 Duty Officer, go ahead." "This is the VT-10 Duty Officer, we have two aircrew in the water and need to alert the SAR for a recovery. The aircrew are located at 275 radial 6 DME from the Navy Pensacola Tacan. Foxfire 106 is on station, but is not SAR capable."

9:22 a.m. . . . HC-16 alerts its SAR crew.

9:23 a.m. . . . VT-10 initiates a Navy Blue Oprep-3 via telephone to the Navy Command Center, and continues with its pre-mishap plan procedures.

Meanwhile Foxfire 106, on station at the downed aircrew location, observes the following. Shortly after water entry, the pilot and student Naval Flight Officer each enter their one-man life raft with no difficulty. The pilot of OF40 is then heard to make the following radio transmission.

"Mayday, Mayday, Mayday . . . This is pilot of OF40 safely in the water six miles west of NAS Pensacola Tacan."

"Roger, this is Foxfire 106. We have you in sight but are not SAR capable. We have notified your base, and can

remain on station for two hours."

Upon seeing Foxfire 106 in the area, the pilot of OF40 ignited his day orange smoke signaling device to alert what he thought would be his SAR pickup helo. After water entry and boarding of his life raft, the student naval flight officer (SFNO) activated his PRC-63 survival radio which has only a beacon signal and no press-to-talk capability. Noticing that his pilot had activated his orange smoke device, the SNFO elected to save his for later use and began his attempt to paddle his life raft to the pilot.

9:34 a.m. . . . Foxfire 103 enters the vicinity of the SAR effort.

Visual contact between the aircrew and the SAR helo was first established by the pilot of OF40.

"SAR helo, this is the pilot of OF40, how do you hear?"

"OF40 this is Foxfire 103, we hear you loud and clear. Do you have us in sight?"

"Roger Foxfire 103, I have you in sight. I am at your one o'clock position approximately 1½ miles. My SNFO is about one-fourth mile south of my position."

"OF40, this is Foxfire 103, we have you in sight and are moving into position for a swimmer drop. Are you injured?"

"Negative, Foxfire 103, I will abandon my raft when the swimmer enters the water."

9:49 a.m. . . . The pilot of OF40 and the SAR swimmer are hoisted aboard Foxfire 103.

Upon seeing the successful recovery of his pilot, the SNFO ignited the day orange smoke signalling device and was successful in alerting the SAR helo to his position. The SNFO elected to stay in his life raft until the SAR swimmer reached him and deflated his raft.

9:58 a.m. . . . The SNFO of OF40 and the SAR swimmer are safely aboard Foxfire 103.

10:16 a.m. . . . Foxfire 103 and 106 land safely on deck at NAS Pensacola.

This event was not an actual aircraft mishap but a well coordinated SAR/Pre-Mishap Drill. Prior to the drill, HC-16 was contacted by the VT-10 Safety Department. The subject was realistic training for both squadrons.

It was decided that both the T-2 aircrew and the VT-10 Duty Officer would know nothing of the drill until the events actually took place, as would happen in the real scenario.

Upon return from a regularly scheduled flight, the T-2 aircrew of OF40 were directed to taxi to the transient line where they were met by the Aviation Safety Officer. They were then escorted to HC-16 and briefed. Once loaded upon a UH-1, the aircrew of OF40 were transported to Perdido Bay where they were lowered into the water, and the drill began.

Lessons learned were presented at the Tra-Wing Six quarterly safety standdown by the pilot, SNFO and the VT-10 Duty Officer. The findings are worth quoting here.

— A proper pre-mishap plan is essential for the Squadron Duty Officer.

— Periodic training, such as unannounced mishap drills, is also important for the SDO.

— The SDO cannot do it all alone. He needs to be able to call on anyone and everyone for help.

— Liaison with various support units should be included with any training evolution.

— Nutrition for the selected mishap flight crew is an important, often neglected consideration. The crew in the VT-10 drill had not eaten proper meals all day, and by the time they had returned to dry land were very hungry. If a crew goes down in the late afternoon, without eating lunch, they are already into a survival situation so far as food is concerned. Therefore, always *eat* before you fly.

— The "mishap" crew experienced difficulty in joining up in the water, even in a calm sea. Paddling their rafts took a great deal of effort.

— The SAR helo crew found detection of the downed crewmen difficult, even in the calm water.

— The pencil flares included in the survival kit were found to be almost useless, unless the helo crewmen happened to be looking directly at the flare, which, after all, only has a burn time of 4.5 seconds.

— Even though it was a VFR day, with lots of sun, a low haze prevented the signal mirrors from being of any great use.

— When the SAR Huey arrived, one of the "downed" crewmen jumped into the water — the proper procedure — while the second man remained in his raft. The man in the water was picked up, while his comrade in the raft found himself being blown about by the relatively light downwash of the helo's blades. Had this been an actual mishap, with a heavier helo, such as a CH-46 or SH-3, being used, the downwash could have swamped the raft and its occupant, thereby adding to the danger and possibility of drowning.

Although this type of training will do little to *prevent* a mishap, it could well lead to a better chance of survival and a successful rescue. ◄

Capt. Curlin is an A-6 B/N and the VT-10 flight officer and former squadron safety officer.

A Case of Synergism*

By Cdr. Felix Tormes, MC

THREE days before returning to CONUS from Cubi Point, a healthy, athletic, 30-year-old, experienced plane commander began to have stomach problems. The two-week deployment had been successful with a full flight schedule of ASW missions. The pilot had flown a total of 20.5 hours in the previous three days with adequate rest between missions. Two days before departure, the problems worsened with continued diarrhea and vomiting. Between the bouts of diarrhea, however, he performed his collateral duties and even completed a four-hour rigging mission. Being a jock, he thought perhaps a good three-mile run one day before departure would "clean the system out." A sauna followed the run. His intake on the day of departure was several caffeinated soft drinks and some broth. The P-3 was scheduled for a 2200 departure with a full crew (three pilots.)

The first 6.5 hours of the non-stop transit flight presented no problems for the pilot, who slept two hours before relieving the plane commander. While sitting in the left seat, at FL 290 and a cabin altitude of 10,000 feet, he began feeling weak with abdominal cramps and light-headedness. He was relieved and escorted aft by the off-duty flight engineer. By the time he reached the aft observer station, he felt exhausted and began losing his balance. He became pale, collapsed and lost consciousness. He remained totally unresponsive for approximately three minutes, during which time he was placed on the bunk, had his feet elevated and was given 100 percent O_2 by an alert CPO. He regained consciousness, but remained confused and combative for two minutes, requiring restraint by three crewmen. He remained conscious, but required continuous O_2 and was hydrated slowly with frequent sips of sugar-containing water. Four hours later, he was transferred to a waiting ambulance at a CONUS NAS and was admitted for treatment at a naval hospital, where he received intravenous fluids resulting in rapid improvement overnight.

Now let's review the sequence of events to see how the synergistic effect of the preceding events led to a serious incident.

1. Vomiting and diarrhea, of course, deplete water. Sodium and potassium are two important salts lost in the process. In addition, caffeinated beverages promote further loss of fluid by their diuretic (urine-producing) effect. A sauna bath, with its attendant sweating, exacerbates the loss of fluid and of additional electrolytes. An additional source of fluid loss is termed "insensible loss" and occurs in prolonged flights at altitude due to the low relative humidity of air in upper altitudes, as water vapor is constantly lost through the breath and skin. The net effect of all these conditions is a very significant dehydration.

2. Gastrointestinal symptoms such as vomiting, diarrhea and abdominal cramps are invariably worsened at altitude, even in pressurized aircraft. The essentially empty GI tract still contains a significant amount of trapped air which expands at altitude, worsening the discomfort and cramps.

3. The lack of caloric intake, coupled with a generalized illness, results in a catabolic state, in which the body resorts to the breakdown of stored glycogen in the liver to maintain a normal blood glucose (sugar) level in order to supply calories for normal metabolic activity. Transient changes in the blood glucose levels are possible.

4. Prolonged flight at altitude exposes an individual to mild hypoxia. At a cabin altitude of 10,000 feet, the alveolar partial pressure of oxygen (the amount of oxygen actually getting to the lungs) is 61 mm Hg, as opposed to 103 mm Hg at sea level. This is within tolerable limits for *healthy* individuals.

5. The effects of fatigue associated with an increased operational tempo and the chronobiological effects of long trans-meridian flights are difficult to factor into the equation; however, it can be stated without fear of contradiction that the effect is detrimental to function and wellness. The aerospace literature recently has reflected an increased awareness of the adverse effects of altered patterns of sleep, eating and elimination on aircrews.

The healthy naval aviator/NFO/aircrewman can probably tolerate each of the above conditions *in isolation.* However, the synergistic effect of all these factors simultaneously will probably incapacitate even a young, healthy individual.

From the flight surgeon's standpoint, the ideal solution would be the systematic elimination of all factors detrimental to function in a flying capacity. Realistically, however, operational commitments and the commendable desire of the aircrew to be tasked and to complete the mission often results in overzealousness.

The moral of the story is this: the well-trained crew member should appreciate the risk in which he places himself, the aircraft and the mission when he flies in less than optimal physical condition. The whole point of our recurrent physiological training is to educate our flight crews on the adverse effects of conditions such as dehydration, hypoxia and fatigue. Even more important, however, our aircrews should have an understanding of the great risks that accrue when these conditions occur simultaneously. Mild hypoxia and fatigue, coupled with "a little GI trouble" and "a little dehydration," can and have resulted in total incapacitation of a healthy aviator. ◄

*Synergism — the simultaneous action of separate forces which, taken together, have a greater total effect than the sum of their individual effects.

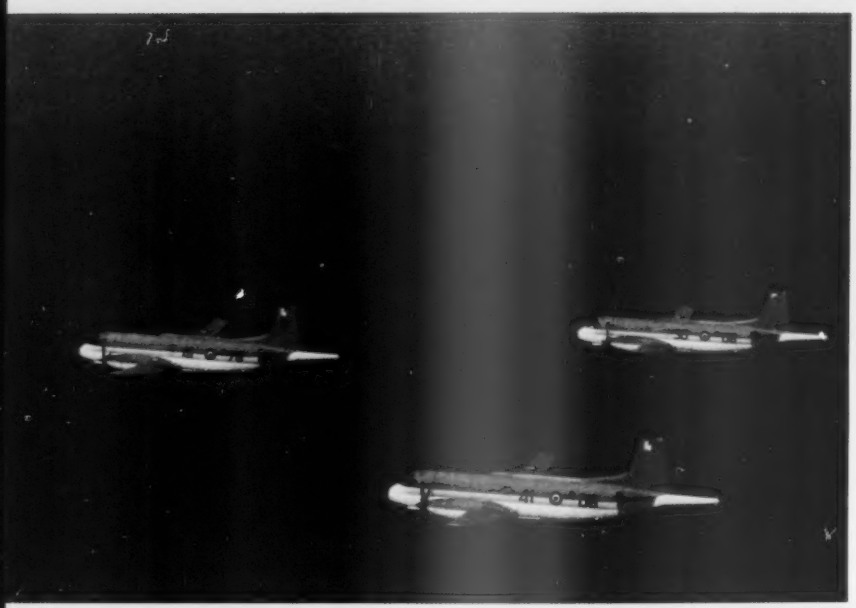
Cdr. Tormes is the flight surgeon with Patrol Squadron 67.

Italian Air Group Shares U.S. Navy Base

Thank God They Don't Fly Like They Drive

By Bud Baer

. . . . *"If a pilot has no fear, he's not a safe pilot. He's a potential killer"* . . .



Italian BR1150s in flight, they play an important role for NATO in ASW surveillance over the Mediterranean.

Sigonella, Sicily — "I don't have *any* trouble understanding air controllers here," Lt. Col. D.K. Catella said.

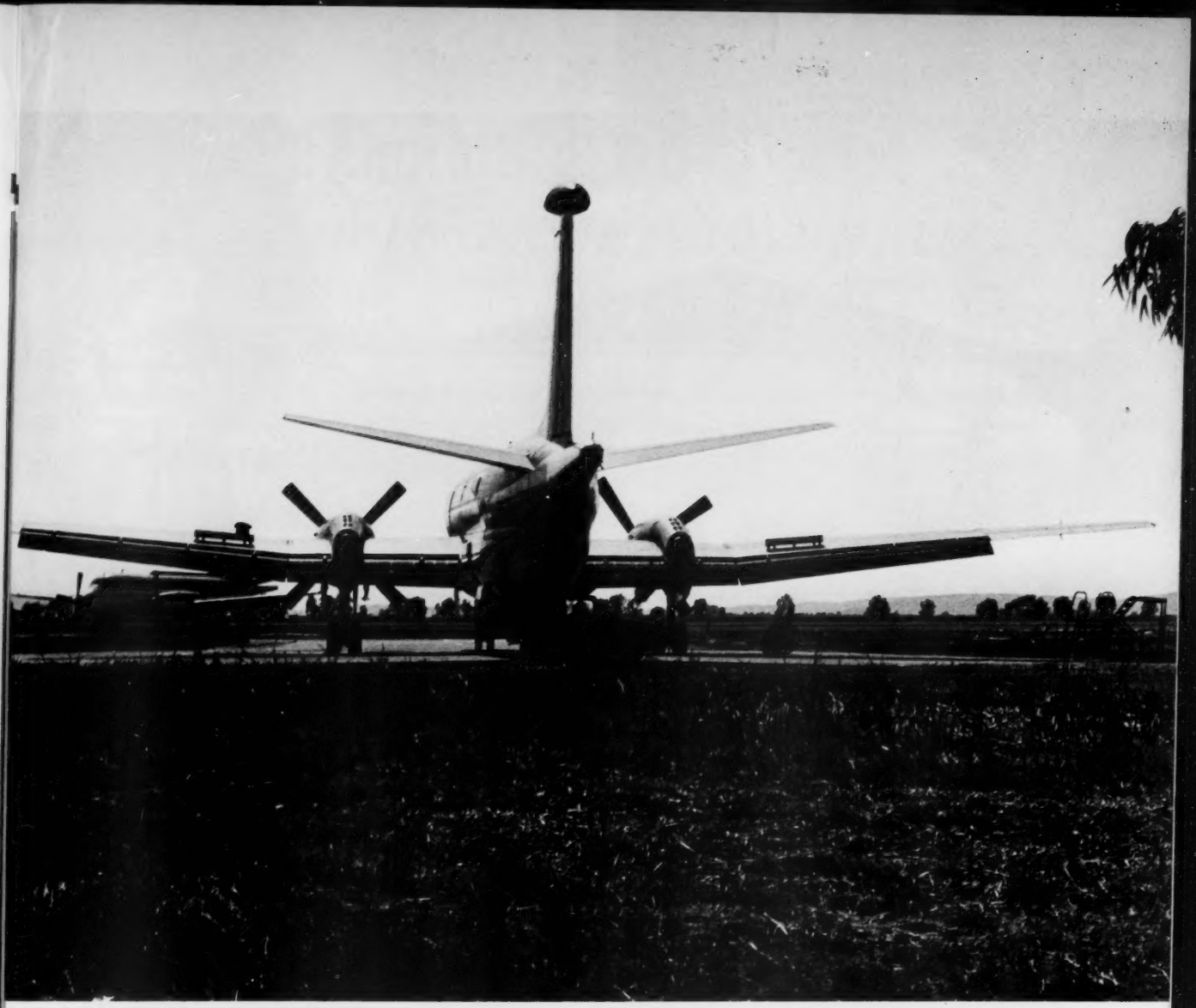
"Could the fact that you're an officer in the Italian Air Force (IAF) and commander of an Italian anti-submarine warfare (ASW) group make it easier for you to communicate with the Italian-operated air traffic control (ATC) at the U.S. Naval Air Station at Signoella?" I asked.

"Not so," responded Catella, who speaks English fluently. "Our controllers talk in flawless English and *that's the problem*. Your people don't speak English very well. You use too much slang that our operators don't understand. Also your pilots from the South speak a lot different than your pilots from the North. This drives our ATC people up the wall. If you would *all* learn to speak English and avoid slang, everything would be OK."

Some U.S. aviators who fly in and out of Sigonella in the foothills of Europe's highest and mightiest active volcano, Mount Etna, have a language problem with Italian ATC controllers. Sometimes they must ask for clarification of instructions to make certain they are understood *and vice versa*. If things get real sticky, though, a U.S. controller is available in the tower to assist.

What about Italian aircraft getting preference over U.S. aircraft when landing or taking off? Some U.S. pilots seem to think they do.

"This isn't true either," Catella noted. "I had to wait 40 minutes last week before getting clearance to take off. All operational aircraft take precedence over training aircraft, you should remember. For example, our F-104s based here are always allowed



An Italian BR1150 on the ramp at Sigonella, Sicily, is being readied for an ASW mission.

in first because most of the time they're nearly out of fuel."

Catella's outfit is known officially as "88⁰ Gruppo A/S," which means "88th Group ASW." The 88th is part of the 41st Wing in the IAF. When the group was formed late in the 1960s, the IAF and the Italian navy had a flap about which service would run it. In Italy all air bases are under cognizance of the IAF, except for some helicopter stations. On the other hand, the Navy was always inherently responsible for anti-submarine warfare. To resolve this matter equitably, it was decided that the 88th should be a jointly operated Air Force/Navy group.

"The system works very well," said Lcdr. Gaetano Galzerano, group operations officer and an Italian navy pilot trained at Pensacola. "When the pilot is an IAF officer, the co-pilot will be from the Navy. When the pilot is a naval officer, the co-pilot is from the IAF."

Is there any similarity in how cars are driven in Italy and how aircraft are flown?

"No way," asserted Catella, who acknowledged that automobile drivers in his country are "rather aggressive — almost fearless."

"If a pilot has no fear, he's not a safe pilot," he emphasized. *"He's a potential killer.*

"We have a flight safety officer who works in the same manner as those in your Navy squadrons. Flight safety is very important and we work at it diligently. In 40,000 hours of flying over a 10-year period, our group has had *no major safety problems*. We haven't had more than a half dozen engine failures during this entire period. Our maintenance people are very skilled and do their jobs properly. Our pilots are

Italian ASW aircraft, an Atlantic BR1150, is shown by its hangar at its base in Sigonella, Sicily.

dedicated and well-trained — many of them trained in your country.

"We do more than fly operational missions. We have a program to maintain the professional level of our pilots to maximum proficiency. Each pilot undergoes 10 hours of proficiency flying monthly with much emphasis on safety and how to survive emergency conditions. All of them must pass a rigorous flight check at least once a year and more often for those who are showing marginal indications. If our pilots show too much confidence — or rather over-confidence — we warn them because we feel this is not a safe mental attitude for flying."

The 88th flies the Atlantic BR1150, a fully equipped, twin-engine ASW plane built by Dassault-Breguet of France. Its Rolls-Royce Tyne turboprop engines are extremely reliable, according to Catella, and the aircraft can fly on one engine if necessary. These planes are used regularly on ASW surveillance, normally for 10-hour flights at altitudes generally from 500 to 3,000 feet. These low-level flights are coordinated with other NATO allies who may be patrolling the Mediterranean in the same or nearby areas. The primary mission is looking for Soviet submarines and the positions of the Soviet fleet in their work for NATO. When needed, the BR1150 is also used for search and rescue missions.

Catello has spent some time in the United States. He took primary and basic flight training from the U.S. Air Force at Selma, Ala., in T-41s, T-37s and T-38s. He became a transport pilot in the IAF early in his military career, flying C-119s and C-130s.

He's been in the ASW business at Sigonella since 1978, having completed half his 12-year tour at the base. He said the long assignment is necessary in ASW "to understand it thoroughly because it involves intelligence work." He has commanded the 88th for the past year.

Italy has only one other ASW group headquartered at Cagliari, Sardinia. Catella was asked, "Is it commanded by a naval officer in line with the policy of splitting ASW responsibility between the two services?"

"No, it is commanded by an air force lieutenant colonel like myself." He smiled. ◄

Bud Baer is a staff writer for Approach.

. . . "If you would all learn to speak English and avoid slang, everything would be OK" . . .

Fighter Aircraft Class A F/FRM Rates vs. Pilot Experience CY 77-83

By Michael Borowsky

Graphics by Frank L. Smith

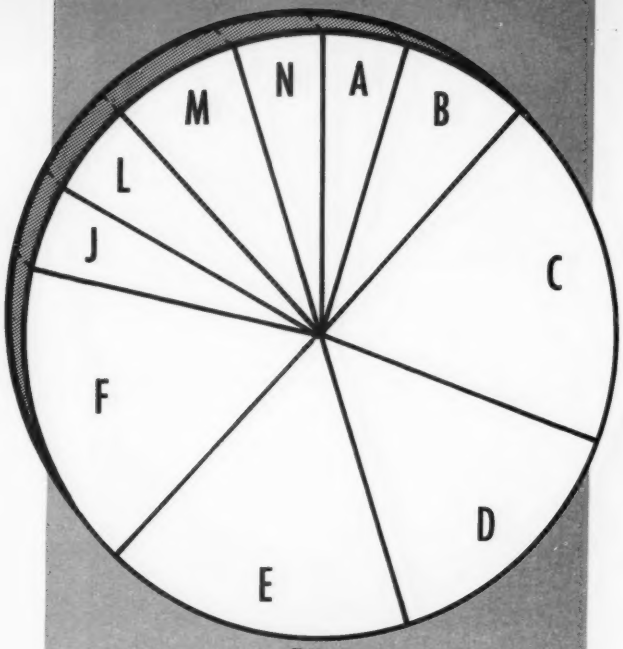
The charts on this and the following pages show Class A F/FR pilot factor mishap rates as functions of lifetime hours in model and total hours. The rate for a specific experience level is the number of pilots in control and at fault at that level per 100,000 flight hours accrued by *all* pilots at that experience level — not merely those in mishaps. Specific problem areas with the numbers of occurrences are provided for the specific experience levels.

Major categories of problem areas are shown only if they are represented by at least two mishaps. Therefore, the pie charts do not have a uniform number of "slices."

The pilot factor mishap rate in fighter aircraft was not significantly (α = .24) related to time in model in itself. The mishap rate was, however, significantly (α = *.03) associated with total hours. Interactions between these factors showed that this significance was due to very high mishap rates for fighter pilots with less than 750 total hours who also had less than 300 hours in model.*

Follow-on articles will break down the rates for prop and helo aircraft.

Michael Borowsky is the head of the Statistics and Mathematics Department at the Naval Safety Center. He has a doctorate in mathematics from Drexel University.



Fighter
Lifetime Hours in Model: 0-300
Total Hours: 0-750
25 Pilots
Rate: 10.85

A. Violations of regulations/NATOPS — 2 (4.76%)
Violation of specific orders and regulations (SOP) — 1
Inadvertent violation of NATOPS — 1

B. Physical/mental condition of pilot — 3 (7.14%)
Fatigue — 2
Distraction — 1

C. Improper use of flight controls in air — 8 (19.05%)
General misuse — 1
Poor takeoff technique — 1
Improper spin recovery technique — 2
Improper post stall gyration recovery techniques — 1
Over rotated — 3

D. Improper response/technique for CV/FCLP landings — 6 (14.29%)
Waveoff — 2
Not lined up — 1
Attitude control — 1
Improper scan or correction for "meatball" — 1
Excessive sink rate — 2
Glideslope control — 3
Power management — 1

E. Failure to maintain flying speed — 7 (16.67%)
Sufficient airspeed for maneuver — 5
Poor takeoff technique — 1
Improper recovery technique from unusual attitude or stall — 1
Improper recovery technique from fully developed spin — 1
Failure to recognize approach to stall — 1

F. Judgment errors — 7 (16.67%)
Failure to recognize dangerous situation — 3
Inadequate evaluation of circumstances — 1
Distance too close between aircraft in "in flight ops" — 1
Altitude above ground/water on target run — 1
Miscellaneous — 3

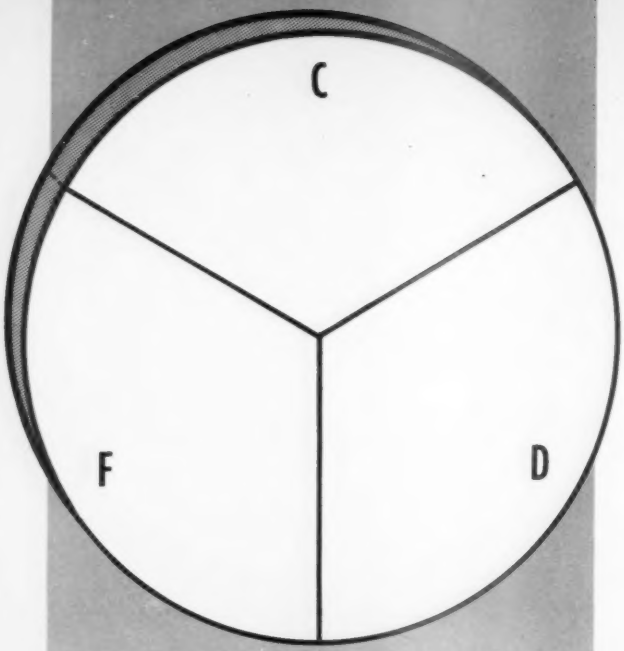
J. Exceeded ability and/or experience — 2 (4.76%)
Emergency/unusual situation placed pilot beyond limits of experience — 2

L. Inadequate lookout procedures — 2 (4.76%)
Failure to see other aircraft in air — 1
Failure to utilize available external lighting — 1

M. Pilot preoccupation at critical moment — 3 (7.14%)

N. Improper emergency technique — 2 (4.76%)

Note: Mishaps generally involve multiple factors. The sum of factors (A — O) may, therefore, exceed the total number of pilots. Likewise, the sum of the subfactors under a particular factor may exceed the specific factor total. The percentages are based on the sum of factors (A — O), not the number of pilots.

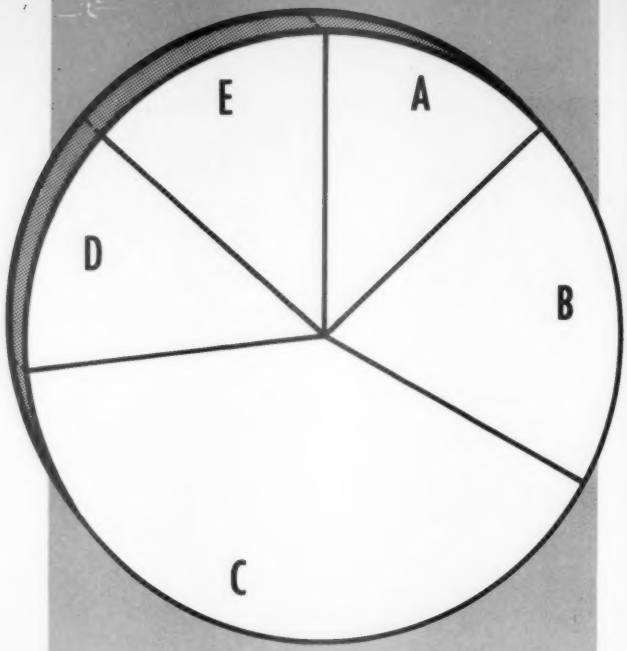


Fighter
Lifetime Hours in Model: 0-300
Total Hours: 750+
7 Pilots
Rate: 3.01

C. Improper use of flight controls in air — 2 (33.3%)
Improper spin recovery technique — 1
Improper post stall gyration recovery techniques — 1

D. Improper response/technique for CV/FCLP landings — 2 (33.3%)
Excessive sink rate — 1
Glideslope control — 1
Slow response to LSO signal — 1

F. Judgment errors — 2 (33.3%)
Distance too close between aircraft in "flight ops" — 1
Failure to recognize dangerous situation — 2
Miscellaneous — 1



Fighter
Lifetime Hours in Model: 301-500
11 Pilots
Rate: 4.57

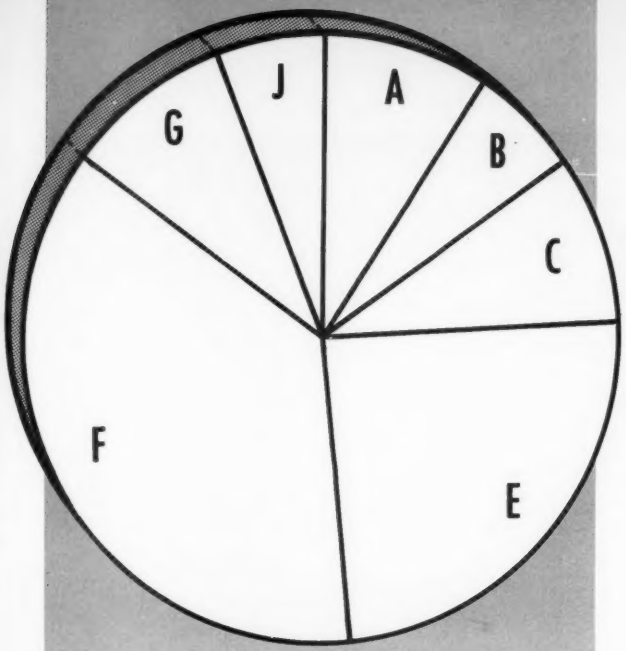
A. Violations of regulations/NATOPS — 2 (13.3%)
Violation of general air discipline — 1
Violation of specific orders and regulations (SOP) — 1

B. Physical/mental condition of pilot — 3 (20.0%)
Disorientation — 3

C. Improper use of flight controls in air — 6 (40.0%)
Excessive sink rate in landing approach — 1
Overcontrolled — 1
General misuse — 1
Improper post stall gyration recovery technique — 1
Improper spin recovery technique — 1
Over rotated — 1

D. Improper response/technique for CV/FCLP landings — 2 (13.3%)
Waveoff — 1
Not lined up — 1
Attempted to salvage poor approach — 2

E. Failure to maintain flying speed — 2 (13.3%)
Sufficient airspeed for gross weight — 1
Sufficient airspeed for maneuver — 1



Fighter
Lifetime Hours in Model: 501-1000
24 Pilots
Rate: 5.51

A. Violations of regulations/NATOPS — 3 (9.09%)
Violation of specific orders and regulations (SOP) — 1
Inadvertent violation of NATOPS — 2

B. Physical/mental condition of pilot — 2 (6.06%)
Fatigue — 1
Anoxia/hypoxia — 1

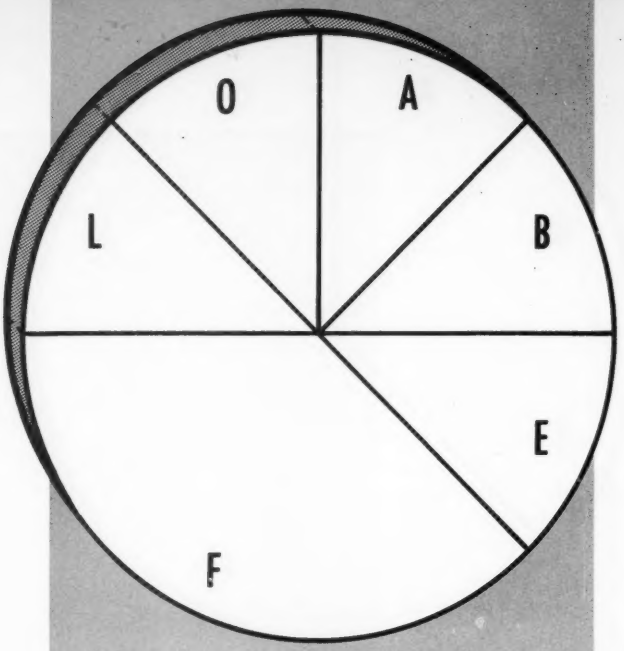
C. Improper use of flight controls in air — 3 (9.09%)
General misuse — 1
Poor landing technique — 1
Improper spin recovery technique — 1

E. Failure to maintain flying speed — 8 (24.24%)
Sufficient airspeed for maneuver — 6
Improper recovery technique from unusual attitude or stall — 1
Improper recovery technique from fully developed spin — 2
Failure to recognize approach to stall — 1

F. Judgment errors — 12 (36.36%)
Distance too close between aircraft in "flight ops" — 2
Collision aircraft because of misjudged distance in formation — 1
High in landing approach — 1
Failure to recognize dangerous situation — 3
Inadequate evaluation of circumstances — 1
Miscellaneous — 7

G. Inadequate flight preparation — 3 (9.09%)
Flight controls and airframe — 1
Accepted aircraft with known discrepancies — 1
Incomplete preflight due to haste/preoccupation — 1

J. Exceeded ability and/or experience — 2 (6.06%)
Insufficient refresher experience — 1
Emergency or unusual situation placed pilot beyond limits of ability — 1



Fighter
Lifetime Hours in Model: 1000+
11 Pilots
Rate: 3.56

A. Violation of regulations/NATOPS — 2 (12.5%)
Violation of general air discipline — 1
Inadvertent violation of NATOPS — 1

B. Physical/mental condition of pilot — 2 (12.5%)
Loss of, or failure to gain night adaptation — 1
Complacency — 1

E. Failure to maintain flying speed — 2 (12.5%)
Sufficient airspeed for maneuver — 2

F. Judgment errors — 6 (37.50%)
Collision aircraft because of misjudged distance in formation — 1
Failure to recognize dangerous situation — 2
Miscellaneous — 3

L. Inadequate lookout procedures — 2 (12.5%)
Failure to see other aircraft in air — 2

O. Improper level off — 2 (12.5%)
Poor landing technique — 2

A foul deck waveoff and a bolter in the F-4, and our signal is tank. So I clean up and climb to 3,000 feet.

Who's Got the Lead?

By Lcdr. C.B. Campbell

THERE I was, pitch black night, 30 degrees nose down in an unusual attitude passing through 1,000 feet with the call "PULL-UP, PULL-UP!" ringing in my ears. Not an optimum situation, you say? I agree. How could I ever have gotten myself into such a predicament? At the time I was about four months into my first cruise as a brand new Ltjg. and a member of a Phantom squadron deployed in Westpac. I was crewed with a seasoned old Lcdr. who was showing me the ropes.

On this particular black moonless night I am taking my turn in the barrel. A foul deck waveoff and a bolter in the F-4, and our signal is tank. So, I clean up and climb to 3,000 feet. Ah, there's the tanker, but it's behind me. It is now my job to join on the tanker, right? Wrong. He is in a better position to join on me, but I ASSUME that he will continue to fly his pattern in the hawk circle, and I ASSUME it is my job to join on him, regardless of the situation. After all, I want the gas, so I have to go get it. The well-known saying about what happens to you and me when we assume is about to be verified.

There is no radio communication between the tanker and my aircraft, and there is no cockpit communication between me and my mentor. So, all is right with the world. My plan is to level my wings and let the A-6 tanker continue his left turn to the inside. I will then slow down, cross under to the inside of his turn and join on the 45-degree bearing line.

The tanker is now crossing my six and is on my left side. I slow from 250 knots to 200 knots. The A-6, only a green flashing spot of light on a curtain of black, moves forward on my left side but stops forward movement when he is still only about 50 degrees off my tail. Meanwhile, I am trying to get to the inside of this turn and under him, so I slow to 180 knots and commence an easy port turn. Still no discernible movement. I slow to 150 knots. Is he getting closer? . . . YES!; constant bearing and rapidly decreasing range. At night, closure cannot be visually detected until the rendezvous is almost completed. I'm certain we are about to collide. All that is visible is A-6 belly and wingtip lights above and below me. He is closing in excess of 100 knots. Just prior to the impact that seems only milliseconds away, I jam the stick forward into the instrument panel and duck my head.

The next thing I hear is "PULL-UP! PULL-UP!" over the radio. I go right to my gyro, level my wings, add power and begin a smooth pull up. I note that we are about 30 degrees nose down. As the nose passes through the horizon, the altimeter begins counting up from 300 feet. The A-6 now on my right wing is performing a similar maneuver. How he got from my left side to my right side I'll never know. The B/N made the pull-up call that saved four lives. We climb back up to 3,000 feet, tank and trap on the next pass. Mission complete.

In the debrief the A-6 aircrew agreed that we all had a pretty close call, but the incident was not widely publicized until now. The most important lessons that I learned were:

— Don't ASSUME. This incident would never have occurred if I hadn't made the assumptions about rendezvous procedures when the hawking tanker was behind, instead of in front of the bolter aircraft.

— Communicate. Explaining my intentions to my experienced RIO might well have avoided the entire situation. As it was, he assumed the tanker was joining on us, and while watching the rendezvous was unaware that our aircraft was slowing down and trying to join on the tanker. Simultaneously, the tanker aircrew assumed that they were performing a rendezvous, on an F-4 level at 3,000 feet, 250 knots in a 30-degree angle of bank. They assumed we had the lead, and I assumed they had the lead. A brief transmission between aircraft could have easily averted the near disaster.

We were pretty lucky on this one, but it's about as close a call as I've ever had in naval aviation. It is the closest near midair and the closest I've ever come to flying into the water. I pass this experience on so that others can benefit from it. Squadron SOP, Airwing TACNOTES, CV NATOPS and Aircraft NATOPS procedures are developed to remove ambiguity from every aspect of a flight's evolution. A thorough preflight brief should cover all non-standard phases. When a question arises about any procedure airborne, it's too late to go to the book or rebrief the hop. Don't back yourself into a corner and ASSUME everyone knows what to do. If you don't know, then why should the other guy? Do yourself a favor and ask the question. It's not really better to die than to look bad. ◄

The bottom line on this incident is the loss of situational awareness. Even with the erroneous assumptions and the lack of communication, this incident could have been averted by flying the aircraft first. — Safety Center staff

Lcdr. Campbell is the safety officer for VF-74. He has served with VF-151 and VF-171 as an instructor prior to transitioning to F-14s.

We Need That Airplane!

As the carrier pulled out of port heading for points west, the young plane commander felt the weight of responsibility for having to fly aboard the last of his squadron's beach birds. The OinC's words rang loud and clear in his mind as he preflighted the airplane . . . "We need that airplane out here badly, get here!"

Everything looked great until the control check. There was a persistant, noticeable binding in the ailerons. The troubleshooters did their best with the time they had but, alas, found nothing.

With time running out to catch the ship and remembering the boss's words, he took the aircraft. In flight, the binding continued, so the pilot requested and received a straight-in carrier approach. Once on deck, he downed the aircraft for the binding control problem. End of story? Unfortunately, when maintenance personnel went up to troubleshoot the problem, the controls froze solid on the first attempt to push them past 30 degrees. The reason turned out to be a bearing failure in the aileron control system.

As professional naval aviators, each of us attempts to weigh the "operational imperative" against sound NATOPS procedures and common sense. Heaping the "command imperative" on top of all this could well tip the scales in favor of a tragedy.

Bindingmouse

COD Caper

I am greatly concerned regarding the recent preponderance of formation flights on the C-1A flight schedule. While we are all naval aviators and, as such, have at least a small amount of training in this area, we are primarily *transport* pilots. The C-1A is designated as a *transport* aircraft. Transport aircraft, even in the U.S. Navy, aren't typically required or allowed to fly formation. In fact, the C-1A NATOPS specifically prohibits formation flights while carrying passengers. Transport aircraft typically fly passengers as a major part of their mission.

At any rate, for reasons such as pilot proficiency and that extremely isolated instance when a C-1 has a total communication and navigation failure, an argument can be presented by its proponents to support formation training in the C-1. However, scheduling of four-plane formation training flights leaves doubt as to the squadron's reasoning behind these flights. Is it possible that they are tuning up for another 10-plane fly-by? *In a COD?!* Lord, lead me to a bunker, and tell the pathologists to standby.

C'mon safety, please. Do you really think it's a good idea to have a gaggle of CODs flying around in formation? The C-1A's poor visibility from the cockpit and history of engine malfunctions causing instantaneous yaw make this COD pilot scared to death to be doing this, and I'm far from alone in my feelings. This is a situation where wiser heads should prevail.

Scaredtodeathmouse

I have 5,000+ hours in the S-2/C-1A. In my experience, formation flying is safe in the aircraft and is a necessary skill for a COD pilot. Avionic failures are rather common in the C-1A, but a COD pilot may find himself having to fly form, even with passengers. Since COD pilots don't fly form routinely,

regular practice is the only way to maintain that skill.

Capt. Jack Smith
Chief of Staff
Naval Safety Center

Aircraft Droppings

The problems of things falling off aircraft (TFOA) should be very well known to all in aviation. The requirements and reasons for reporting such incidents should be equally well known.

To my knowledge, four incidents of TFOA have occurred in the past few months at our detachment. "I haven't heard about those," you say?

Well, the fact is the OINC of this Det has refused to allow the messages to go out unless they meet the criteria for mishap reports.

Upon finding out about an incident, he says, "All right, who knows about this besides us? If it's on the range, don't worry about it."

Don't worry about it, indeed!! How can an OINC have an attitude like this?

To me, the reporting criteria for incidents of TFOA are quite clear. I mean everyone from the CNO on down has sent out message traffic concerning the problem.

Now that we all know the problem, I still don't know the solution.

Fallguymouse

Escape Exit Out of Reach

When the aft compartments of the TA-3B aircraft were modified, the seat for radar training station 5 was lowered. However, due to a lack of bolts to attach the seat to the deck, some aircraft were not configured with the station 5 seat installed, as depicted in NATOPS.

My squadron is flying the TA-3B aircraft without the pedestal seat installed in the aft section. Without the seat installed, use of the overhead hatch is difficult. Even with the seat installed, it's quite a stretch to get through the hatch with only one step on the side of the seat.

In an emergency ditching situation, personnel in the aft crew compartment would have a problem exiting the aircraft via their overhead hatch. Actuating the side escape door in a ditching situation is not recommended. In an emergency ground egress when the main entrance door is blocked, the entire crew of eight would have to use the forward ditching hatch to exit the aircraft.

The aft ditching hatch is not normally used, but in an emergency, it is designed to be a major avenue of escape for the five aft compartment crew members. As currently configured in some aircraft, the aft ditching hatch is difficult to reach. This creates a threat to the safety of the flight crew that should be addressed by the Naval Safety Center.

Wayoutmouse

This situation causes a genuine egress problem for flight crew in the aft compartment in the TA-3B, agrees Cdr. John W. Warren, A-3 Analyst, Naval Safety Center. Warren said this heads-up call put the problem on the agenda for the next A-3 program review. In the interim, before a final resolution, the Naval Safety Center has recommended that the seat for station 5 will be installed for all TA-3 flights carrying a full crew in the aft compartment.

Camera Jams Controls

During a local flight over water with two F-4 aircraft, the wingman took several pictures of his lead to complete a photo section for the squadron's cruise book. The pilot had a 35mm camera and took eight pictures during the final portion of an air intercept. The camera strap was looped inside the D-ring on the pilot's harness, and following the run, it was tied to the D-ring, allowing two inches of play.

Following a knock-it-off call, the wingman began a port 180-degree turn. Unknown to the pilot, the knot slipped and allowed the camera to fall and become lodged between the forward edge of the seat pan and the aft edge of the control stick. The pilot immediately noticed he couldn't pull back on the stick.

The use of the trim button alleviated any nose attitude adjustment. The wings were leveled while a request for lead to join the wingman was made. The pilot looked for hydraulic problems and found no indication of a failure. He then looked around the control stick area, found the camera and removed it. This alleviated the problem.

This problem could be minimized by only carrying equipment which is essential to the completion of the mission.

Camerashymouse

Your point is well taken, but what if the camera had been mission essential? The problem here is not excess gear; it is stowage of gear. Aircrews are issued cameras on a regular basis for everything from reconnaissance to public affairs photos. They should be able to manage them in the cockpit. — Ed.

This Is *My* Padeye

By Lcdr. G.R. Murchison

I absolutely cannot believe that I've had to claim this padeye — clinging to it with both hands, body flapping in the jet blast like a flag in a stiff breeze!

I am:

1) A bit apprehensive (or a lot scared!) — that a few feet behind me is the edge of the flight deck and a 65-foot drop to the water.

2) Embarrassed — that I, having spent countless hours hammering flight deck safety precautions into the junior and new men, am the one that's proving my own point that a moment's inattention is unacceptably unsafe.

3) Angry — that I allowed myself to get caught in this situation.

How did I get here? I was making one last inspection of the area just forward of the waterbrake on Cat 4 for FOD prior to launching the fighters. In the meantime an early-go A-7 tanker was being moved up the deck from the fantail for launch off Cat 1. I saw the A-7 coming and knew he'd be making a right turn and sweeping my area with jet blast. I made a quick judgment of the distance and knew I was going to get a pretty healthy blast, but that it shouldn't be anything that firmly planted feet couldn't handle — so I didn't move to a safer area. And then three things happened in rapid succession that had me searching, finding and locking onto my very own padeye. The ship started a starboard turn into the wind, heeling to port, the A-7 started his right turn to go to Cat 1 and the pilot came up on the power to climb the hill created by the port list. Result: I'm flapping in the wind and hanging on — scared, embarrassed and angry.

This incident, which could very well have ended as another Class "A" FRM (flight-related mishap) is probably familiar to anyone who has been associated with carrier aviation for any length of time. An interesting aspect is the timing of the incident — in the middle of an extended WESTPAC/IO deployment. Our ship/air wing team was at the peak of proficiency. Everyone was experienced, competent, professional — in short, we were good at what we were doing and we knew it. I knew how close I could get to an A-7 exhaust without being blown down, I knew that today I was well beyond the safe minimum distance — I "knew" too much!

On reviewing flight deck incidents and accidents over the years, I believe there are three especially dangerous times in the course of an extended deployment. The first time is at the beginning of the deployment and is obvious to everyone. The excitement of finally getting underway after workups, the arrival of last minute replacements to fill manning deficiencies and the planning required to meet new and changing operational commitments create an environment in which special care is required in the execution of all phases of shipboard action to ensure safety isn't compromised. Because the requirement is obvious, we generally do succeed in exercising that special care.

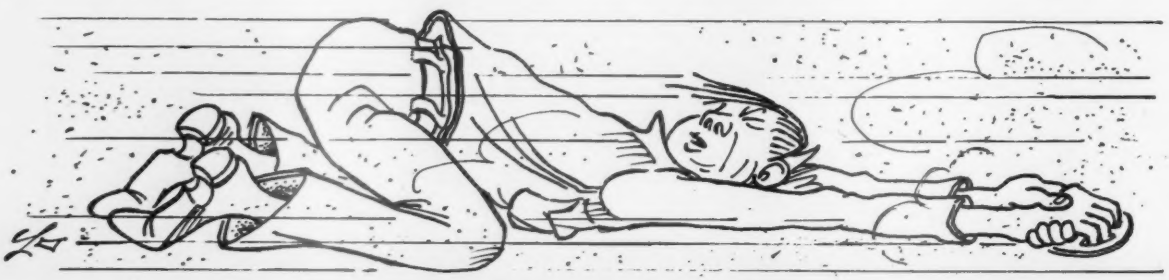
The second high vulnerability period has been characterized as "midcruise complacency" or the "Gonzo Blues." In this phase, operations have become repetitive — typically the ship is parked in the same piece of ocean for an extended period and there is little day-to-day variance in the operational tempo. The "new guys" have been successfully trained and have graduated from being slimey pollywogs to trusty shellbacks. The team has formed — the whole ship is so good at doing what it does that it's easy. *EASY!* Heads up, lads — when you wake up with that "piece of cake" feeling halfway through the cruise, let that be your warning. You've come down with a bad case of Gonzo Blues, and you're a danger to yourself and to your shipmates. This is the time for the "how could I be so stupid, I know better" accident. My own need to claim a padeye for myself is a prime example.

The third and probably the most dangerous vulnerability phase is from just a few days prior to heading home to when the brow is down at home port. A combination of "it's easy," "it's over," and thinking about home combine to dangerously distract us from the job at hand.

The accident of this type that sticks in my mind is when a young man tried to slide under a moving aircraft in front of the mainmounts. He slipped and was crushed but lived on life support machines for two weeks before finally dying.

Operating ships and aircraft is *always* demanding. We must be especially alert to any situation that may allow us to drop our guard, even for an instant. Get the word out!

Lcdr. Murchison is assigned to VA-27, an A-7 squadron based at NAS Lemoore, Calif.



Let's Talk Line-up

By Lt. R.C. Siepel

THE carrier landing a tailhook pilot will most vividly remember is usually the first. Many pilots have a recollection of a stern voice on the radio following their first trap; "Six one three, tower, look to your left and tell me what you see."

"Water, sir."

"And what do you see to your right?"

"Centerline, sir."

After a solemn promise to mend their ways, the students continue on to become full fledged carrier aviators.

Why was that voice in the tower so concerned with the nose-wheel rolling over the centerline plat camera? The obvious reason is to avoid an unplanned swimming refresher or to prevent the transfer of wingtip paint to objects on the flight deck. Another reason may be to prevent the early demise of the cross deck pendants resulting from off center hits. The one thing that many seasoned tailhookers have forgotten is that *line-up affects glide slope.*

It is necessary to have a basic understanding of the visual glide slope geometry to see why this is true. The Fresnel Lens Optical Landing System (FLOLS) or lens projects a wedge of light aft to provide this visual glide slope. The trick to landing an aircraft on a ship is putting the tailhook on the deck aft of the arresting wire. To do this the pilot must have a precision altitude reference; in this case the FLOLS. The pilot simply places his aircraft in a position to line up the "meatball" with the horizontal datum lights. Easy, right?

Several types of carrier aircraft are used to perform many varied missions, so each pilot must see a different "picture" to put his tailhook on deck at just the correct spot. Figure 1 shows that the landing area centerline is offset from the center of the lens. This offset is used to adjust the picture each pilot must see to put his hook on the deck at the right spot.

Figure 2 through 4 show the FLOLS and the way it is rolled from side to side to adjust the glide slope plane. If the aircraft is large, with the pilot sitting high above the hook point, the lens is rolled to raise the glide slope. In the case of a smaller aircraft, (with the pilot close to the hook point), the lens is rolled to lower the glide slope. In this way it is possible to adjust the glide slope for many different types and sizes of aircraft to land with the hook in the wires.

This movement of the lens is called adjusting the roll angle and is used not only to compensate for different aircraft but for ship's trim and to cause the aircraft to land on different wires. Roll angle is measured in units from 0 to 15, with 7.5 being the point at which the lens is vertical and the glide path plane is level. From 7.5 to 15 the glide path is raised and

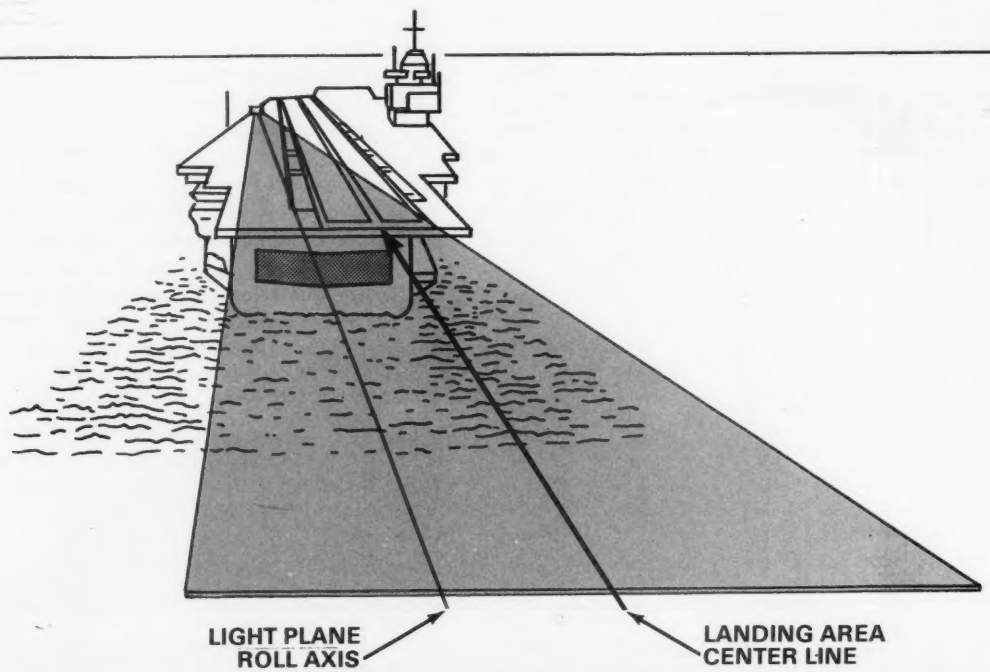


Fig. 1

Effects of Roll Angle Changes on Light Plane

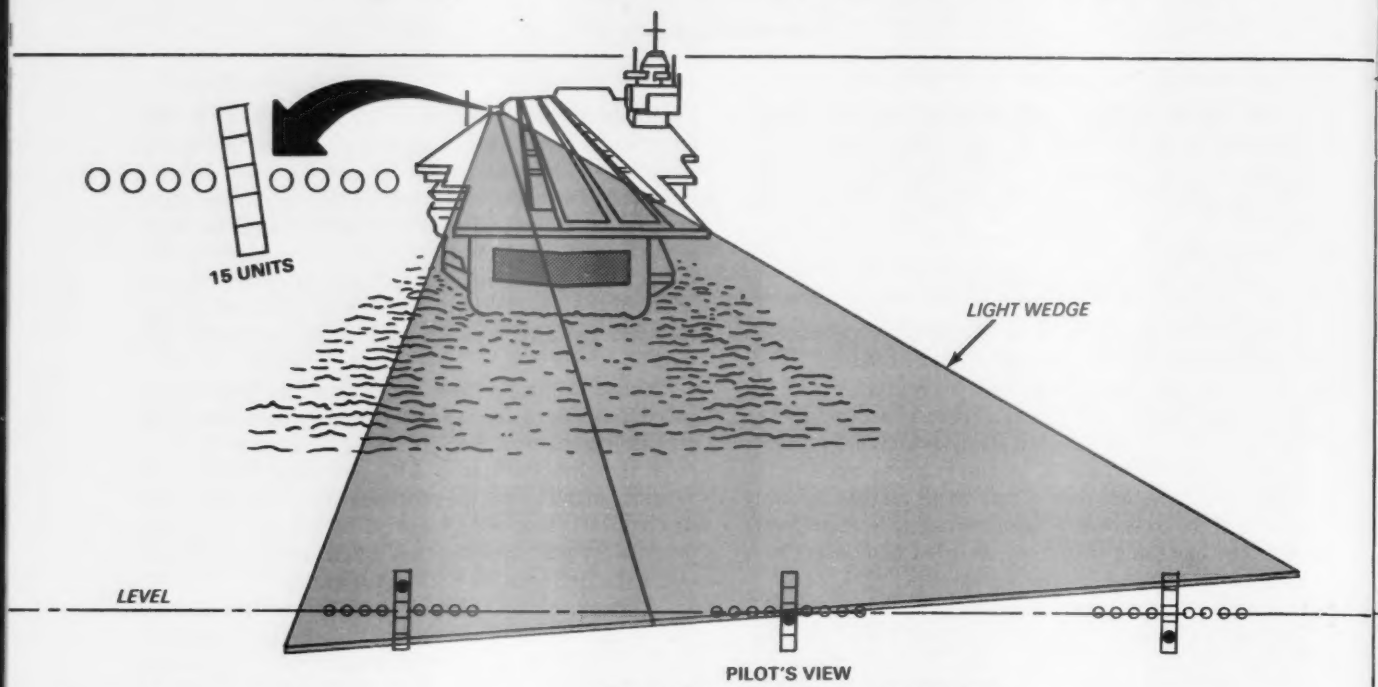


Fig. 2 **ROLL ANGLE 7.5 to 15 UNITS**

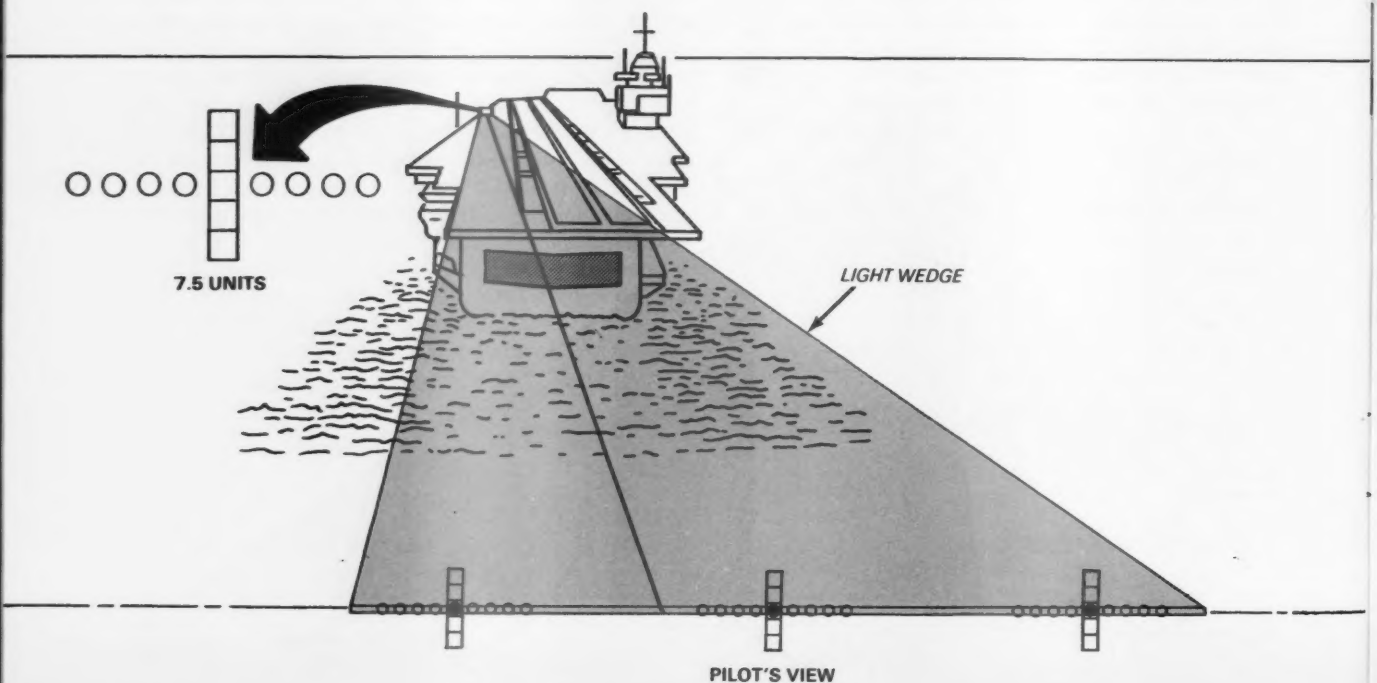


Fig. 3 **ROLL ANGLE 7.5 UNITS (Approximates Horizontal)**

Graphics by Frank L. Smith

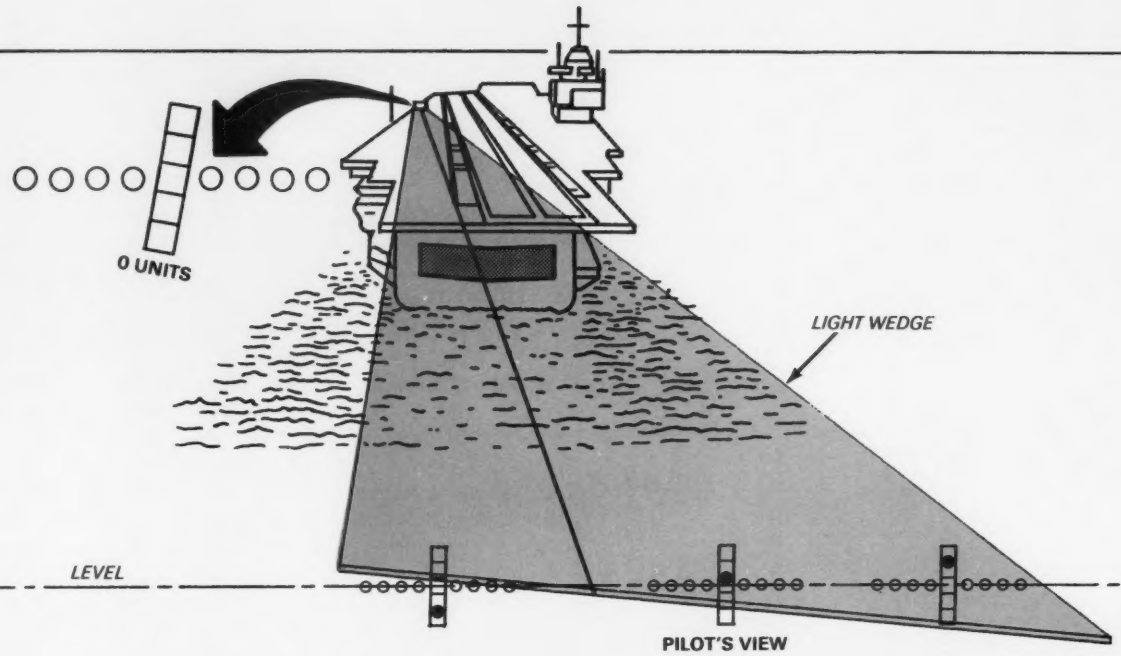


Fig. 4

ROLL ANGLE 0 to 7.5 UNITS

from 7.5 down to 0 the glide path is lowered.

What does all this have to do with line-up? Figure 2 through 4 also show how the change in roll angle varies the glide slope presentation to the pilot. If the pilot is on glide path for the 7.5 unit roll angle setting while on centerline, the very same *altitude* will be low for a higher roll angle setting and high for a lower roll angle setting. The important word to remember is *CENTERLINE.*

The big problem with poor line-up is the way it interacts with glide slope corrections. Even worse, the pilot may be seeing a good glide slope presentation and still be outside the parameters for a safe landing.

With a roll angle greater than 7.5 units a pilot who is lined up to the left and looking at a centered ball will be low. The farther left he is the lower he is, even with the ball centered. Add to this a pilot who accepts a low ball while lined up to the left and the situation can get out of hand in a hurry. As the pilot sees the line-up problem and finally tries to correct to centerline the ball will appear to drop. To correct for this he pilot will add power causing him to go flat. Look at what is happening: a right drift (toward aircraft parked along the foul line) and a flat approach (a leading cause of bolters). No problem, a good pilot could handle it, you say. But, how did a *good* pilot get himself in such a situation to begin with?

Next we have the pilot who overshoots the centerline and is now lined up to the right. He sees the "low ball" and makes the correction. Even though he is looking at a centered ball he is now high because he is lined up right. Once again as the pilot corrects toward centerline he will notice a glide slope change. It will appear the aircraft is climbing so a judicious power correction starts the ball back down. He is now coming left accompanied by a higher than normal sink rate. A right wing drop to correct for the left drift causes a loss of lift and further increases the sink rate. Add to that a strong burble (5 to 10 feet per second sink rate) and a starboard wind (3 to 6 feet per second more) and our pilot may end up with his struts poking up through the top of his wings.

Problems with line-up are caused by a multitude of things, not all of which can be controlled by the pilot. The "moth effect" pulling the pilot toward the ball is one often seen on dark nights. Others include the pilot with vertigo who keeps dropping his wing, and the case of the entire recovery spent looking for the wind. Then there is the poor pilot who has had problems flying the ball and is concentrating so hard he lets line-up drop out of his scan.

The Fresnel lens is a wonderful device but it is only the "meatball" in the old meatball, line-up, angle-of-attack scan pattern. Two out of three ain't bad, right? WRONG! Without all three there can be none of the three. All three are related and all are part of a good carrier landing, i.e., a safe carrier landing. ◄

Lt. Siepel is a landing signal officer (LSO) and a designated E-2 plane commander with VAW-115.

Q: Captain James T. Kirk, Commander of the starship USS Enterprise. What was his middle name?
A: Thadeous.
Q: Who taught Capt. Ken Whiting, after whom Whiting Field was named, to fly?
A: Orville Wright.
Q: How much did FOD cost the U.S. Navy last year?
A: Too much.
Q: Why does Fleet Operational Squadron Alpha go 500 days without a FOD incident, while Squadron Zulu, flying the same type of aircraft in the same operational environment, FODs an engine every 26 days?
A: Squadron Alpha does things right!

Not-So-Trivial Pursuit

By Cdr. Ken Guarino

TRUE enough, you agree, but what is "right"? Everyone seems to be telling the flying Navy to "do things right" and reduce the number and frequency of FOD (foreign object damage) incidents. But the view from Ivory Towers is sometimes clouded and unclear, influenced by layers of command level and distance from the workday environment of the flight line and flight deck. Recognizing that the people who deal with FOD on a daily basis are the best source of information on what is "right," COMMATVAQWINGPAC tasked the Organizational Effectiveness Center (OEC) Whidbey Island with gathering and analyzing data from fleet operational squadrons in order to test the hypothesis that there "exists a measurable difference in procedures/policy/attitude between commands identified as having a high FOD rate and those having a low FOD rate." OEC Whidbey conducted 96 face-to-face interviews with maintenance personnel. Information garnered in those interviews was used to construct a short, to the point miniquestionnaire. The questionnaire was used to identify those factors, of whatever nature, that enhance or detract from an attitude of "professional performance" which impacts upon FOD awareness and prevention.

After all was said and done, what did OEC find out? Hypothesis confirmed: There *is* a measurable difference in the attitudes, policies and procedures of squadrons which experience a low incidence of FOD occurrences. So here in a nutshell are the characteristics of those excellently performing squadrons:

- A low-FOD squadron has a *realistic FOD program*. It's not just lip service to the concept of preventing and detecting FOD. FOD prevention programs in low-FOD squadrons mean something to those who must make them work because they design their own programs. They have ownership in the programs and consider them their own.
- A low-FOD squadron *sets goals*. It involves those who have to work toward the accomplishment of command goals in the formulation of those goals.
- A low-FOD squadron *follows maintenance procedures*. Well, doesn't everyone? Not on your 4790, they don't! Fully *one-half* of the squadrons reported that they routinely modify or ignore established, mandatory maintenance procedures in order to accomplish the work that needs to be done. The most frequently cited reason for shortcutting "the book" was the catch-all cop-out: operational necessity. Low-FOD squadrons reported far fewer instances of not following procedures.

• Personnel in low-FOD squadrons *organize, plan and evaluate*. They organize their work sensibly and involve those who actually do the work in the planning process. They plan for today, they plan for tomorrow and they plan for next year. After each evolution in the operational cycle, they evaluate what they've done right, what they've done wrong and determine what they'll do differently the next time they're faced with the same situation. They hold those who are responsible for the evolution accountable for their actions, but they don't hold grudges.

• Low-FOD squadrons go to great lengths to *keep all hands informed* as to what's going on in the squadron, why things are being done the way they are and what's on the horizon for the command. The commitment on the part of the leadership of low-FOD squadrons to make good decisions at the appropriate level in the command doesn't mean that "participative management" is the rule in that command. It means that people become involved in the goal and take pride in accomplishing the goal. There are, obviously, limits to involving everyone in the decision-making process. However, by emphasizing chain-of-command and proper methods of inputting ideas and recommendations, low-FOD squadrons have been able to get all levels involved.

• Low-FOD squadrons *genuinely care about their people*. They show it by taking an interest and active hand in the careers and professional and personal development of good people. They concentrate those efforts on the E-5 and below sailor by getting him involved and getting involved with him. A partnership is forged with responsibility and accountability on both sides.

• Low-FOD squadrons *place heavy emphasis and importance on the CDI (collateral duty inspector) program*. Low FODers give the CDI program emphasis and importance, and they stress the responsibility and accountability that must be given to CDI-designated personnel. No latitude is given for errors, and those who do their job well are rewarded for their performance.

• Low-FOD commands *encourage and seek innovation* in all aspects of squadron life. There is no such thing as a "we didn't invent it, so we aren't going to try it" mentality. The low-FOD squadron takes whatever works from whatever source and uses it.

There is a bottom line to this whole matter of FOD and FOD prevention. It isn't something new, nor is it trivial. It must be pursued with the same vengeance as ORE (operational readiness evaluation) preparations or pre-deployment workups. It's the "golden needle" of aircraft maintenance and flight safety: *Sustained proper procedures and practices equal effective supervision and leadership*. Nothing more is required to make any command a "low FODer." Nothing less will be effective. ◄

Cdr. Guarino is a designated naval flight officer and completed two cruises with VF-32 and VF-33. He has a subspecialty in organizational effectiveness and was commanding officer of the Organizational Effectiveness Center, NAS Whidbey Island, Wash. He is currently director of training for the Navy's Leadership Organizational Effectiveness School, NAS Memphis.

This is a sample of the questionnaire described by Guarino:

1. In what ways has your command stressed the importance of FOD prevention in the last six months?
2. What FOD training have you had in the last year? (What was it, who gave it, indoc. program, FRAMP, WC, A school?)
3. How effective is your command's FOD program? Why?
4. What is the most effective (beneficial) procedure in the prevention of FOD? Why?
5. What is the least effective (beneficial) procedure in the prevention of FOD? How would you improve it?
6. How interested is the command in your ideas of ways to reduce FOD?
7. How do the rest of the pay grades feel about FOD prevention? Why?
8. What does your work center do to prevent FOD?
9. What work center in the maintenance department, other than your division, shows the most support for the prevention of FOD?
10. What work center in the maintenance department shows the least support for the prevention of FOD?
11. How would maintenance react to a reported potential FOD?
12. If empowered, what would you suggest to the wing commander that would decrease FOD?

Left to right: AW1 Triemer, Lt. O'Neil, Lt. Brock, Lt. Fearnow

Lt. John O'Neil
Lt. Bill Brock
VS-31

Not your standard Navy day. Navy Cecil was reporting field temperatures of 92 degrees Fahrenheit (33 degrees Celsius) with relative humidity of 80 percent. Winds were from the east/northeast at 10 knots. Lt. John O'Neil and Lt. Bill Brock, with their back seaters, Lt. Fearnow and AW1 Triemer, had prepared their S-3A for a fly-on to USS *Dwight D. Eisenhower* as Dash Two of a two-plane flight. The aircraft's gross weight was 45,000 pounds, carrying two empty aero ID drop tanks and 1,500 pounds of sonobuoys. O'Neil had calculated his prelaunch takeoff data and arrived with single-engine climb performance of +25 feet per minute gear down and +175 feet per minute gear up. As the flight was cleared for takeoff on Runway 9R, both Dash One and Dash Two ran up and made last minute cockpit checks. Dash Two took a 1,500-foot interval on Dash One during the takeoff roll.

Airborne, passing 500 feet MSL/140 KIAS with landing gear up and locked, Dash Two was commencing its rendezvous when the crew heard a loud bang with a sudden left yaw. Number one engine was overtemping and engine rpm indicated zero percent. Visual inspection revealed the engine had actually seized. The throttle was secured and emergency procedures followed, with the exception of jettison of external stores due to the concentration of civilian population east of Navy Cecil. With his excess airspeed, O'Neil was able to climb to 800 feet MSL while Brock completed the engine failure checklist, including dumping fuel. As the crew declared an emergency, the aircraft was turned to set up for a left downwind for Runway 18. In the turn, altitude could not be maintained and a 200-foot-per-minute rate of descent was experienced. O'Neil set up for a three-mile straight-in to Runway 18L, but again, in the base leg turn, a positive rate of climb could not be maintained. The aircraft descended to an altitude of 400 feet MSL before rolling out on centerline. Concerned over additional drag caused when lowering the gear, the cockpit crew agreed to jettison the external stores over a clear area on the extended centerline prior to lowering the gear. They notified the tower of their intentions and proceeded to attempt external jettison. Nothing happened. O'Neil then pressed the EXT JET button several more times, still without success. Once straight and level on final and 5,000 pounds lighter from dumped fuel, O'Neil was able to climb to 500 feet MSL at two miles, landing gear still up. He continued his attempt to climb until approximately one mile at 600 feet MSL where he then lowered the gear and hook and transitioned to a PEL-type approach. Brock secured the fuel dump, confirmed the gear was down and the landing checks were complete. The aircraft was transitioned to the landing attitude and touched down approximately 1,500 feet down the runway. They rolled into the arresting gear (3,200 feet from the approach end) and completed a successful field arrestment.

BRAVO ZULU

Lt. M.O. Wade
VA-22

While flying a night tanker mission in his A-7E, Lt. M.O. Wade of VA-22 heard a mayday radio transmission from NH613, an air wing helicopter, which had crashed at sea in poor weather about three miles from USS *Enterprise.* Although he had experienced a transmitter failure, Wade could receive radio transmissions and elected to proceed to the stricken aircraft and assist the crew who were now in the water. He descended to 1,500 feet MSL, skirting many rain showers, and was barely able to maintain VFR conditions due to precipitation and low ceiling. Wade determined that little information was available to the ship about the emergency or the condition of the survivors; therefore, he attempted to initiate a rescue using his PRC-90 survival radio and IFF emergency squawk. The true nature of the mishap was thereby quickly transmitted to *Enterprise,* and another helicopter was vectored to Wade's IFF idents in response to questions posed by *Enterprise* CATTC, utilizing standard no-aircraft-transmitter communication procedures. However, as the rescue helicopter approached the survivor's position, it had to abandon the rescue effort due to electrical difficulties and Wade again assumed on-scene command. He established PRC-90 radio contact with a utility boat from USS *Arkansas* which was attempting to find the crew. Due to the adverse sea and weather state, he was required to direct the utility boat to within 150 yards of the survivors before they were sighted. Despite both very poor weather and communication problems, Wade's efforts resulted in the location of the downed aircrew and their rescue. Throughout the SAR effort he displayed exceptional airmanship, flying his aircraft at low altitude, at night, in and out of rain showers in a successful effort to save his shipmates. ◄

Ed. note — From one single-seater to another, "Sierra Hotel!"

Como. J.C. Breast
COMNAVSAFECEN

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LETTERS

Re: Takeoff/Landing Hazard on Intersecting Runways (Air Break, Aug '84)

NAS Corpus Christi, Texas — I read with great interest Air Break's lead story in the August 1984 issue concerning the two P-3Cs attempting to "cross the 'T'" at intersecting runways.

While the errors of the controllers are self-evident (failure to allow for minor delay on takeoff roll while granting clearance to land to opposing aircraft), my interest increased when I reread the article and found that the pilot rogered (the clearance) and *switched to departure control*. Having done my first tour in the ICAO (vice FAA) system as a station pilot, I was even more surprised to learn that it was SOP in many places to switch to departure control while crossing the hold short line prior to commencing takeoff roll. Not only acceptable — but *procedurally correct*.

Perhaps a bit more thought ought to go into avionics systems and flight procedures regarding this matter. In the two aircraft I flew overseas, we had the capability for a one-button push to switch an active frequency to a preprogrammed standby frequency (standard off the shelf Collins VHF in the C-131) or a simple switch on the mixer panel to switch from an active to a preprogrammed frequency (C-12).

Our practice was to switch to departure control after rotation and wheels in the well. After all, what better way to hear of conflicting traffic but, more to the point, announce an abort emergency to the controller closest to the scene? Consider the obvious benefits of such procedures in the case of the two P-3Cs. The tower controller's cancellation of the takeoff clearance would have been clearly heard by the departing aircraft.

While the switch to departure control before takeoff has benefits to operators of single radio/single piloted aircraft, I fail to see any advantages to those of us flying multipiloted/multi-engined aircraft.

Lt. W.P. Holland
VT-27

• Our November 1984 issue carried a letter commenting on the same Air Break item. It was submitted by AC1 George B. Schneider, AC(A1) School, NATTC, NAS Memphis, Tenn. He posed numerous questions and recommended amending the wording of an applicable FAA regulation. He also said, "When cleared for takeoff, do it. But you do *not* have an inalienable right to that piece of concrete."

The following is a response to Schneider's letter from our own expert on the subject:

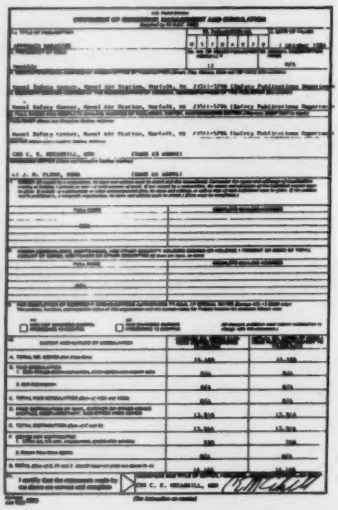
This incident should provide the basis for a lively training session on controller/pilot procedures and technique. Actual answers cannot be provided here since the article was derived from an aviation hazard report submitted by an overseas station.

Procedures for safely clearing an aircraft for expeditious takeoff or cancellation of same, to continue holding in takeoff position or to taxi off the runway are very clear in the air traffic control procedures and phraseology handbook (FAAH 7110.65). Any time a controller asks a pilot if he can be airborne within 30 seconds or something similar, he is creating a situation that can quickly get beyond his *control*. Schneider's recommendation to modify FAAH 7110.65, Para 994, has merit and should be advanced through his COPCOM channels.

Finally, I can't agree with his statement that pilots "do not have an inalienable right to that piece of concrete." It is incumbent upon the tower controller to separate an arriving or departing aircraft from anything that moves while that aircraft is on the runway. A pilot cleared for takeoff or landing *does own the runway*, figuratively speaking, unless he receives a change of instructions from ATC. Takeoff without undo delay referenced in OPNAVINST 3710.7 is for pilot *guidance* only . . . There are just too many factors that can affect a pilot's time on the runway, and the controller must be prepared for this in judging and anticipating.

ACCM Frank G. McGee
Air Traffic Control Analyst
Naval Safety Center

Approach welcomes letters from its readers. All letters should be signed though names will be withheld on request. Address: Approach Editor, Naval Safety Center, NAS Norfolk, Va. 23511-5796. Views expressed are those of the writers and do not imply endorsement by the Naval Safety Center.



Re: Rituals, Phobias and Preflights (Oct '84)

Could it be that the aviator in the photograph just thought he had his helmet on while preflighting the top of his aircraft? With the plethora of injuries to personnel falling from heights to hard decks, I am sure this aviator was not attempting to make his point more clear at his own risk. Too bad . . . and it was such a good article.

Lcdr. Robert R. Wolfe
Safety Officer, VA-145

Re: "Seat Belts and Harness . . . Set Spectacles . . . On" (Nov '84)

Yorktown, Va. — I enjoyed Lt. Lineger's article about vision, flying and spectacles. If one had their "druthers," obviously one would prefer not to wear spectacles. But, to need them and not wear them is, as Dr. Lineger says, "downright dangerous."

There are two facts that need correcting. The spectacle lenses for pilots/NFOs are made of tempered glass and not CR-39 plastic, as per NAVMEDCOMINST 6810.4G. Also, the sunglasses are N-15, that is they reduce light intensity by 85 percent but do not eliminate "glare."

Capt. P.G. Eklund, MSC
CO, Naval Ophthalmic Support and Training Activity

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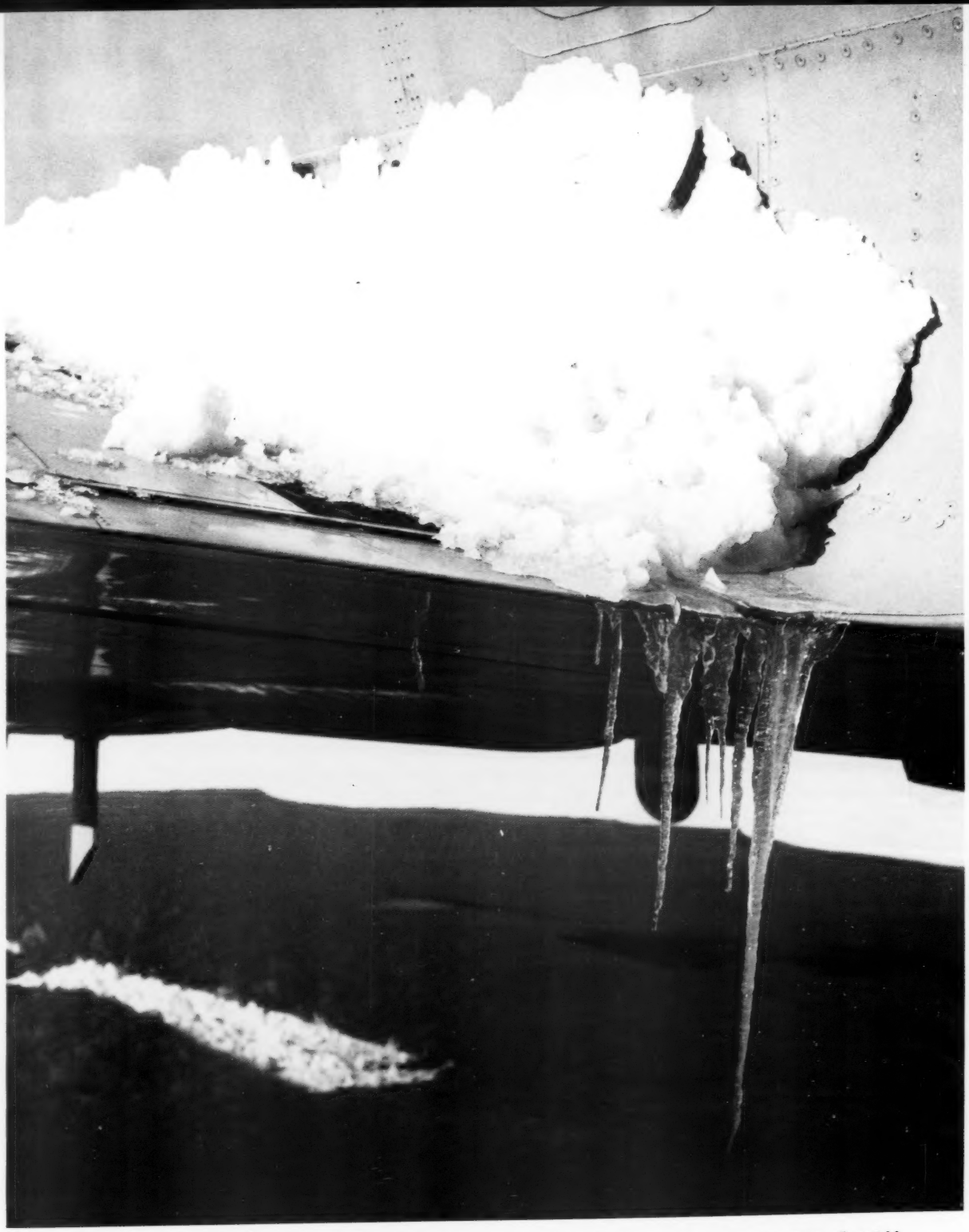

"No problem. It will all blow off when we taxi. Right?"

If you need an accident to admit there is a problem, then you are part of the problem.

Naval Safety Center
NAS Norfolk, Virginia